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ABSTRACT

In seven chapters, this report details the Science Fair Self-Help Development Program, which was initiated in a pilot project at three middles schools in Albuquerque, New Mexico, during school year 1991-1992. The purpose of the program was to provide guidance to schools in developing their own parental and community resources into a sustainable support group whose major function would be to assist the school's science teachers and administration in all aspects of the science fair. The report documents the development of the Self-Help Program and the results of the pilot testing. Seven appendices comprising the greater part of the document include materials for organizing science fairs and copies of the survey forms used in the study. (Author/PR)

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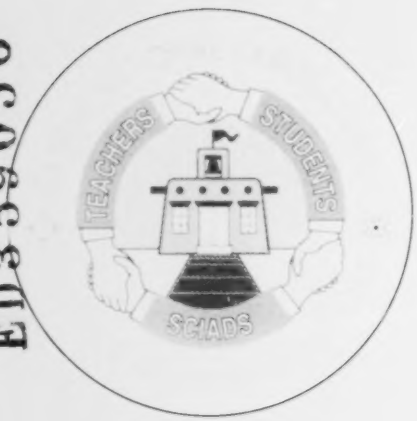

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David F. Menicucci

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Development and Testing of a Science and Engineering Fair Self-Help Development Program: Results of the Pilot Program in Three Middle Schools

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Abstract

This report details the Science Fair Self-Help Development Program, which was initiated in a pilot project at three middle schools in Albuquerque, NM, during school year 1991-1992. The purpose of the program was to provide guidance to schools in developing their own parental and community resources into a sustainable support group whose major function would be to assist the school's science teachers and administration in all aspects of the science fair. The report documents the development of the Self-Help Program and the results of the pilot testing.

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The author also acknowledges the efforts of a large group of individuals from each of the three schools -- Taylor Middle School, Washington Middle School, and St. Charles Borromeo School -- who participated in this effort. Their diligence and professional attitudes were instrumental to the success of the program. The author also acknowledges the efforts of the Manzano Sunrise Chapter of the Kiwanis Club for its members' efforts, enthusiasm, and professional contributions.

Finally, the efforts of the reviewers of this document are recognized: Mary Tang (Sandia) and Paul Veers (Sandia), who provided peer review, and Janet Chapman (Moriarty Middle School parent) and Sue Mistretta (peer support teacher, Albuquerque Public Schools), who were external reviewers. Their suggestions and comments were very helpful in improving the quality of this report.

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1. Introduction

In 1990, Sandia National Laboratories developed an educational outreach program designed to help improve math and science education in schools. A major part of the effort was based on the Science Advisors (SCIAD) program. The SCIAD program allows Sandia's technical staff to spend up to eight hours per week working with schools. The Sandia participants in the program (SCIADs) serve as resources for teachers by providing technical consulting, developing hands-on science demonstrations for teachers and students, and identifying and providing resources to the schools through loaned Sandia equipment (McKernan, 1991).

Although most SCIADs are assigned to a single school in which they work exclusively, some SCIADs possess unique skills that are of value to all of the schools. The Science Fair Facilitator, who provides general assistance to all schools in developing or enhancing science fairs, consulting with SCIADs and schools on the methods and processes of fairs, and developing tools and resources to organize school fairs is a general consulting position. Since the SCIAD program focuses on elementary and middle schools, these grade levels are also the focus of the efforts of the Science Fair Facilitator.

This report details the development of a self-help program concerning science fairs that I initiated during my tenure as Science Fair Facilitator. I was selected for this position based on my experience with science fairs, including 15 years of judging experience in school, regional, state, and international science fairs as well as my working knowledge of the operational aspects of fairs at the regional and local levels.

Most of my first year as the Science Fair Facilitator was spent accumulating materials and consulting with many local elementary and middle schools. A main objective was to assess problems areas and needs within the various school science fair programs and to develop possible solutions that could be implemented through my position as the Science Fair Facilitator. Most of these activities were concentrated on middle schools, because many elementary schools have opted to conduct an invention convention rather than a science fair.

By the end of the first year of the program, I had accumulated enough empirical evidence to draw several conclusions:

1. The quality and organization of science fairs vary greatly among schools. Some fairs are very well organized and professionally conducted. In these fairs, both the discipline of science and a professional approach are evident in all aspects of the fair including the fair's organization, judging, and student projects. At the other extreme are schools where the science fair appears to be, at best, a sideline or secondary activity. In these schools the fairs are often not well organized and produce rather poor quality projects.

2. Schools with very active and productive science fair programs are well supported by parents and community volunteers who freely contribute time, talent, and donations. These volunteers tend to assist in all aspects of the science fair process including the logistical activities, the judging, and the mentoring and/or tutoring of the science fair participants during the development of their projects.

3. Published materials about science fairs are abundant. However, nearly all of the material focuses on how to develop and complete a science fair project. Typically, these documents describe how a student selects a project, applies the scientific or engineering method, and creates a display and report. A small amount of the published material addresses how the science fair itself is conducted including organizing the judging, techniques for scoring projects, and establishing rules about displaying projects.

   Virtually no published material exists that describes how a school can develop internal support for the science fair based on parent and community involvement. Such material would be useful to those schools who want to build a productive and successful science fair program like the type described in item 1 above.

Because the lack of information about developing support for school science fairs is a basic shortcoming, I developed a program to address this need. The program is called the Science and Engineering Fair Self-Help Development Program, and its purpose is to provide guidance to schools in developing their own parental and community resources into a sustainable support group whose major function is to assist the school's science teachers and administration in all aspects of the science fair. A main objective of this program was to engender the kind of internal support structure that has naturally occurred in some schools and which creates high-quality science fair programs. I assumed that if guidance could be provided on how to create such support in a school, it would result in a long-term, sustainable program that would produce better quality school science fairs. The improved quality of the fair would provide students with a more enjoyable science fair experience, high quality science fair projects, and promote a more efficient and productive involvement from parents.

The Self-Help Program was developed in August 1991, before the school year began, so that it could be pilot tested in selected local middle schools. The results from this pilot program were expected to provide the basis for developing a document that could be distributed to interested schools about how to generate an internal support program.

This report documents the development of the Self-Help Program and the results of the pilot testing. Section 2 provides background information about the theory of parental and community involvement in schools, which is the basis for the Self-Help Program. Section 3 describes how the theory was applied to develop the self-help concept and how the self-help concept was intended to work. In Section 4, I outline the implementation plan, the selection of the pilot schools, and the procedure for initiating

the program in each school. The observable results of the effort at each pilot school are found in Section 5. Section 6 contains an analysis of the quantitative information gathered through a follow-up survey at each school. Section 7 summarizes the conclusions and outlines recommendations for future research and development.

Seven appendixes contain various supporting and ancillary materials used or developed through the program. Examples of the information provided in the appendixes are the Sandia presentation materials used to kick-off the Self-Help Program at each pilot school, a bibliography of published resource information about science fairs, and the science fair resource materials and organizational documents developed by the Science Fair Support Committee at each pilot school.

2. Information on the Theoretical and Practical Basis of Parental and Community Involvement in Schools

The Science and Engineering Self-Help Development Program is based on the concept that schools can benefit from the involvement of parents and community volunteers. These benefits are well documented in the educational research community.

Human and Social Capital

Coleman is probably the preeminent authority on this subject, publishing numerous scientific papers and reports. His views are clearly outlined in his commissioned report to the U.S. Department of Education entitled "Parental Involvement in Education" (Coleman, 1991). In this document he reviews the historical trends of parental involvement in education and current practices. More important, he describes the theoretical basis for why schools benefit from parental and community involvement. He believes that schools should profit from human and social capital, both of which exist in the form of parent and community volunteers.

According to Coleman, human capital is the personal resources of an individual, including his/her talents, education, and experience. Social capital exists in the relations between people, which facilitates growth and productive activities based on personal interactions. Since all members of the community have talents of some kind, human capital is available to the schools through parents and volunteers. To utilize human and social capital, the school must attract these persons to the school.

The creation of social capital, however, requires the development of human relationships and interactions between the volunteers and the students, teachers, and administration. When successful, the resulting positive experiences and influences can benefit the school.

Historically, schools have been served by the social and human capital available through families. Parents who provided their talents to the school through volunteer activities produce human capital. Social capital is provided by the relationships they develop between themselves, their children, and the school; these relationships create a role model that can be emulated. In recent years, however, many schools have not fully developed the potential of the available human and social capital resources. One reason may relate to the increasing numbers of families in which both parents work, which tends to limit the time available for parental involvement in school and educational functions. Thus, under these circumstances, the development of this capital resource may be more difficult now and may require special techniques that may not be well known within school communities.

Studies Indicating Positive Results

If properly applied, parental involvement in schools can produce positive results. Epstein presented a study with much supporting evidence that indicated that parental involvement does improve the quality of education (Epstein, 1987). In addition, Epstein cited a large number of studies that also support the value of parental support in schools. She contends that collectively the research suggests that "schools and families will be more effective organizations if they work together to identify and achieve common goals."

However, in another study, Convey suggests that parental involvement works best in private and parochial schools where human and social capital have historically been developed and integrated (Convey, 1987). Although these two studies largely agree about the benefits of social and human capital in schools, they suggest that the differences in developing this capital at private versus public schools should be explored further.

Parents are not the only source of human and social capital for schools. Sapone and the New York State school board have suggested that community volunteers can be used to improve educational processes (Sapone, 1989; NY State School Board, 1991). Sapone showed that the use of community volunteers serving as mentors "expands the use of the available resources into the school curriculum without generating additional costs to the district." The New York State document elaborates on many "benefits of collaboration between the external community and the school," as well as developing the school community as its own source of social capital. The Utah State Office of Education apparently agrees with this approach. They have created a master plan to integrate community volunteers, especially retirees, into the Utah school system (Utah State Office of Education, 1988). The single purpose of this plan is "to increase volunteerism in the public schools."

Evidence exists that the development and use of social and human capital can effectively occur at all levels of education including elementary through high school. Gubbels presented a case study of how a community-based mentoring program has been successful in an elementary school in Omaha (Gubbels, 1989). This school focused on the use of parent and community volunteers to provide support for the teachers and administration. LeCompte documented a similar positive experience in the use of parent involvement in a public high school in Pasco, WA (Lecompte, 1990). This study is particularly interesting because the community consists primarily of low income families, which often have two working parents. In this effort, the school developed some special techniques to develop the available social and human capital. Probably the best evidence for the widespread applicability of human and social capital in education came from Arnold et. al, in 1989. This work, which is a comprehensive list of related publications, identifies a large number of studies documenting successful school and community interactions in a wide variety of educational levels (Arnold et. al, 1989).

However, the evidence also suggests that administrators and teachers need assistance and training to make parental/community involvement productive. In a 1987 paper, McAfee stated that although parental involvement in schools has been proven effective, "many teachers and administrators work with parents reluctantly--even grudgingly." McAfee went on to suggest that one "explanation is that teachers and administrators do not have education and training in how to work effectively with parents and the community" (McAfee, 1987). Chavkin and Williams also suggest that both administrators and parents may not possess the full range of skills to fully apply volunteer services in the school. As a result, "administrators fail to capitalize on parents as an educational resource and parents fail to latch onto administrators as access points to the increased involvement they desire" (Chavkin and Williams, 1987).

Summary

In summary, the research strongly suggests that the application of social and human capital can be instrumental in improving schools, specifically in student classroom performance. This type of capital is usually developed from traditional sources, such as parents. However, community volunteers are another important, and often overlooked, source of capital. Together, parents and community volunteers are substantial resources for schools.

Two uncertainties still exist. One is whether the development of human and social capital is more effective in private rather than public schools. The second is whether some special consideration should be paid to the suggestion that some special training may be needed for community volunteers, parents, teachers, and administrators to elicit the maximum benefit from an interactive relationship. Both should be considered in the design of a program that promotes the development of human and social capital within a school.

3. The Design of the Science Fair Self-Help Concept

Science fair activity varies widely among schools. In some schools, the science fair is a time for community involvement, group planning, and action. In many, perhaps most schools, the science fair process is viewed by many teachers and parents as a confusing event laden with much extra work and few rewards.

When the community is not involved in the school's science fair, teachers not only must maintain their teaching duties, but are often expected to manage all of the related activities including planning the fair, helping students prepare their projects, soliciting and qualifying judges, and attending to all of the details concerning organizing and conducting the fair. Most of this work must be performed after normal work hours, usually with no additional compensation. Moreover, some of this work may require some specialized background and/or training that teachers often do not have (McAfee, 1987; Chavkin and Williams, 1987). For example, the procedures for soliciting judges, qualifying them, and organizing them into a team requires special knowledge about judging criteria and techniques as well as organization theory. These skills are often not provided through a teacher's educational founda ions and must be acquired by special training. As a result, the job is frequently viewed as difficult and confusing, and the outcome is often disappointing.

Parents can also become discouraged with the science fair process. Many parents, even those with scientific backgrounds, do not understand the science fair process. Much of the confusion relates to the schedule of events, the fair's rules and regulations, the selection of topics for projects, the judging criteria, and the educational value of the experience. Without proper guidance on these items, the science fair can leave many parents bewildered and frustrated.

In an environment where both teachers and parents are confused and discouraged, students have difficulty developing the motivation and enthusiasm to create innovative and competitive projects. Reduced motivation leads to disinterest that can sharply reduce participation or even kill a school's science fair.

The Science and Engineering Fair Self-Help Development Program is intended to address these problems. The program was conceived around the concept of developing social and human capital based on both parent and community volunteers. The principal objective of the program is to help schools develop social and human capital within the science fair program by creating a team of administrators, teachers, parents, and community volunteers to assist and manage all areas of the fair. With the bulk of the organizational and specialized activities managed by this team, teachers can concentrate on their job of teaching science.

Sandia Involvement

Sandia's role in the program is to provide technical and organizational guidance to both the school and its volunteers to help them form a productive team. As outlined by McAfee, as well as Chavkin and Williams, training is essential to maximize the benefits of any school/community interaction (McAfee, 1987; Chavkin and Williams, 1987).

An important feature of the Self-Help Program is its flexibility. The program is specifically designed to allow the school community to tailor the development of its science fair support group and associated activities to meet its specific needs. For example, each school involved in the pilot program was encouraged to assess the needs and desires of the community regarding the science fair. Based on this assessment, the school was to develop a plan to meet these needs. Sandia's role in this part of the project centered on consulting and training on the process of developing a plan to meet the specific needs. This approach is necessary because a science fair support program developed by and for the school and community holds the greatest chance for long-term success and sustainability after Sandia's involvement has ceased. The concept of the school helping itself to solve its own problems was fundamentally the most important and overriding operational guideline throughout the pilot testing program at each of the three schools.

Science Fair Volunteer Support Committee

After identifying the school's needs and objectives, the Science Fair Self-Help Program assists the school in finding solutions and developing an action plan. The schools were encouraged to create a formal committee to implement the program. At least three subcommittees were recommended to provide the basic support to the science fair process; these included logistics, judging, and mentoring. Additional subcommittees were encouraged to address specific problem areas. For example, one pilot school encountered difficulties in gaining support for the science fair activities from its parent teacher organization (PTO). They responded by forming a subcommittee to lobby the PTO for support and resources. In general, the science fair support committee was encouraged to formalize its operation by electing officers and committee chairs, keeping minutes of meetings, and maintaining financial records. The science fair support committee is referred to in this report as the Science Fair Volunteer Support Committee (SFVSC).

The logistical subcommittee has the broadest charter and is the least specialized. This committee handles all of the organizational activities needed to organize and run the fair. Examples of these activities include securing a location for the fair, selecting and ordering prizes and awards, publishing and distributing information about the fair, organizing and conducting educational workshops for parents and students, soliciting and thanking volunteers, and managing refreshments for volunteers. The logistical subcommittee also provides support to other committees as needed, for example, handling mailings to prospective judges.

The judging subcommittee specializes in the judging, and its main responsibilities include identifying, soliciting, and training judges, as well as organizing and conducting the judging process. Managing the judging process includes assigning judges to projects, collecting and summarizing scores, and selecting fair winners.

The mentoring activities are handled by a third subcommittee. The word mentor comes from a Greek myth and historically denotes a trusted guide and counselor for a younger member of society (Sapone, 1989). The subcommittee's purpose, therefore, is to guide and assist the science fair students in conducting their experiments, drawing conclusions, and preparing their displays. Mentoring may involve one-on-one tutoring between a student and a technical professional or it may occur through workshops in which technical guidance is provided in a group setting.

The three principal subcommittees within the SFVSC offer a variety of opportunities for parents and volunteers with different skills and talents. Individuals with little or no technical background may serve on the logistics committee, which is often in need of personnel to deal with its large variety of labor intensive tasks. Those with technical skills can serve on the judging and/or mentoring subcommittees.

Science Fair Facilitator

As part of the Self-Help Program, the role of the Sandia Science Fair Facilitator, in which I served, was planned to be both an advisor and technical resource. I expected to focus my efforts on organizational consulting, technical training, and identifying resources. Examples of organizational consulting are providing guidance about how to structure, organize, and conduct the SFVSC and its subcommittees. For instance, Robert's Rules of Order may be suggested as the proper method for conducting meetings.

As a technical consultant, I planned to hold discussions and briefings on the methods of performing various science fair activities. Often such briefings would consist of identifying and applying techniques that are commonly used in other localities. For example, several judging organization guides are available and are in use at other schools and/or in the regional and state fair. The identification and procurement of these guides, along with some assistance in interpreting and tailoring them to the schools' fair, would be my responsibility. Also, for the SFVSC activities for which few published materials exist, like mentoring, I would serve as a personal consultant and advisor in the discussion of how to approach these activities.

Finally, I was to help identify both human and written resources for the SFVSC. Human resources (volunteers) would be identified through informal networks that I developed through many years of involvement in community science fairs and through more formal approaches such as advertising in local newspapers or in the newsletters of local technical organizations and civic clubs like Lions and Kiwanis. After identifying potential volunteers, I planned to turn the names over to the SFVSCs for follow-up. Written resources, which consist of publications about science fairs, were to be identified

through literature searches in local libraries and through the services of Sandia's technical library. Copies of the appropriate documents were to be made available to the SFVSCs.

4. Implementation of the Science Fair Self-Help Program Pilot Project

A plan was developed to pilot test the Self-Help Program in various schools. The main objective of the testing program was to measure the efficacy of the program and to correct any deficiencies. These experiences would be incorporated into a self-contained instructional guide that would describe how to apply the self-help concept in other schools without Sandia's direct involvement.

Selection Criteria

One of the most important tasks in the implementation process was to select the schools that would participate in the pilot program. Based on the resources at my disposal (one day per week paid by Sandia and two days volunteered), I estimated that about two to three schools could be included in the program. I began this task by identifying the criteria upon which the schools would be selected. Four criteria were identified:

1. **The school must be struggling with the science fair process.** This means that the school must show an interest in the science fair, but have demonstrated difficulties in achieving success. Success is defined qualitatively as the students, parents, and teachers enjoying the experience. More quantitatively, success is defined as a reasonable number of students successfully proceeding to higher level fairs, like the regional and state fairs, and consistently scoring well and winning some awards.

2. **The school must recognize the problem with the science fair process and show a desire for developing a solution based on its own resources and tailored to its own needs.**

3. **The school must have demonstrated administrative and teacher support for the science fair.**

4. **The three selected schools must reasonably represent the schools in Albuquerque.** This means that the schools must reasonably represent the socioeconomic conditions and ethnic mix of most schools in the city. I was also particularly interested in choosing at least one private or parochial school to test Convey's assertion that social and human capital can be more easily developed and applied in private schools rather than in public ones (Convey, 1987).

All of the city's middle schools were reviewed for possible inclusion in the pilot program. Most of the information used in this process was gathered during my first year in the SCIAD program during which many school science fair programs were

reviewed. However, I also consulted other sources including APS teachers, Sandia personnel, science fair leaders, and community volunteers.

I attempted to provide some quantitative information in the selection process. The Northwest New Mexico Regional Science and Engineering Fair includes all of the schools in the Albuquerque and surrounding areas and is the next level of competition after the school fair. Basic information about each competitor along with his/her scores are recorded and maintained by these science fair officials. I thought that the collective performance of the students at the schools might be helpful in selecting the pilot schools. For example, an analysis of the scores may show that a certain school sends many students to the regional science fair but that few of these students receive high scores and few, if any, proceed to the next level of competition. The large number of students sent to the fair is an indication that the school is interested in the science fair. But the low scores may indicate that the process of preparing the students for the rigors of regional competition may need some improvement.

A computer program was written to generate basic statistics for each school and to rank the schools according to the statistics. Schools that consistently ranked near the middle of the sample and exhibited the characteristics of requiring some improvement in the science fair process were considered to be the best candidates for the pilot program. It is important to note that this analysis was used only to provide supplemental information for the selection of the three pilot schools and was not the primary source of information for the decision. Also, the results of the analysis are private and, therefore, are not included in this report.

Pilot Schools

On the basis of the review described above, three schools were selected for the pilot program. A brief description of the three schools follows.

Taylor Middle School

Taylor is a 30-year old public school located in the northwest part of Albuquerque. The 950 students attending the school are racially mixed with about 60% caucasian and 40% minority, most of whom are Hispanic. Most of the students live in middle- or upper middle-class families.

Over the years, Taylor has had a tradition of maintaining a quality science program with reasonable success in the science fair. In recent years, however, some of the parents, teachers, and administrators have become concerned that emphasis on and participation in the science fair had diminished and that some improvements in the science fair process were needed. (The Science Fair is an elective activity for science students.) One parent, in particular, had begun to take action to promote change. When the Self-Help pilot project became a possibility, this person worked closely with the principal, Mr. Eugene Johnson, to express a strong and vocal interest in participating.

The strong parental leadership along with the support of the school's principal were important factors for this school's selection.

Washington Middle School

Washington is one of the city's oldest public schools and is located near downtown Albuquerque. The 860 students attending the school are racially mixed, with the majority being Hispanic. The socioeconomic background of the students spans a wide range between upper and lower classes, with many residing in low income households.

Until recently, Washington has not had a tradition of strong science fair participation. However, a dynamic and insightful administration, led by Mary Mercado, acting principal, along with the team of science teachers have committed to upgrade the school's science program with the goal of becoming a technology magnet school. They consider the science fair, which is an optional activity for science students, to be an essential part of the upgrading process. Moreover, they place an emphasis on developing solutions that focus on the development of internal resources that can be tailored to their particular needs. The demonstrated innovation and self-determination of the administration and staff were the major reasons for Washington's selection as a pilot school.

St. Charles Borromeo School

St. Charles is a private parochial school located east of downtown, near the center of Albuquerque. It serves students in grades K through 8. Although it is considered as a Catholic parish school, about 70% of the students live outside the parish. Many of the 465 students reside a long distance from the school, some as far as 30 miles away.

St. Charles has an outstanding 20-year tradition of very successful science fair participation. The science fair has long been a part of the curriculum and is still required of every 6th, 7th, and 8th grader. Until the mid-1990s, the school's science fair was managed almost solely by the science teacher, usually a member of a religious order who could devote full-time attention, plus substantial unpaid overtime, to organizing and conducting the event. In recent years, however, the number of religious professional teachers in the school has decreased and they have been replaced by lay professionals. The science department, which consists of a single teacher, has been directed by a lay professional since 1988.

The school has recently encountered problems in managing the science fair because the lay professional's family responsibilities do not allow for the large expenditure of unpaid hours required to organize and manage a quality science fair. The school's principal, Mr. Douglas Price, and the science teacher were interested in developing and instituting a new approach to managing the science fair through the use of parental and community support. The interest shown by the principal and teacher in developing a community-based solution was the major reason that this private school was selected for participation in the project.

Self-Help Concept

After the schools were selected, I contacted the respective principals to confirm their agreement to participate in the program. All agreed to participate. I then met with the principals or their designated representatives and asked each of them to organize a meeting of the key staff and parent leaders. The purpose of the meeting was to introduce the self-help concept to the community and begin to form a core group of interested volunteers for the SFVSC. At the meeting, I planned to present an overview of the self-help concept. A copy of the vugraph presentation is found in Appendix A. Following the presentation, the participants would be encouraged to discuss the concept with respect to the problems at their schools and to consider how it might be applied. They would also be encouraged to agree to work together as a committee, identify a team leader (or at least a point of contact), and begin planning to develop the committee into three subcommittees (logistical, judging, mentoring) plus any others that were considered important.

The meetings were successfully completed at each of the three pilot schools. Following these meetings, I began my job of advising the SFVSCs on how to prepare for the upcoming events and activities as well as providing training to the committee members as needed.

5. Results of the Self-Help Program at the Three Pilot Schools

As was intended, the Self-Help Program was implemented differently at each of the three schools. A description of the events at each school is provided below.

It should be noted that the content of this section was reviewed by the principal and the SFVSC at each pilot school. Their suggestions and additions are integrated into the text.

Taylor Middle School

Background

From the first day of the program, Taylor's Self-Help Program was managed by Jan Lewis, a parent. Jan was very interested in improving the science fair program at Taylor and enthusiastically embraced the self-help concept. The program began with the organization of an orientation meeting at the school, which Jan arranged. The meeting was attended by the school's principal, Gene Johnson, several of the science teachers, some interested parents, and the regular Sandia science advisor who was assigned to the school through the SCIAD program. I was the main speaker at the meeting.

I presented the self-help concept to the group and explained the essential features. After some discussion, there was general agreement to proceed with the program. The principal was especially supportive of the science fair and embraced the idea of involving parents in the science fair process. He also pledged to provide the necessary resources to help the program succeed. The meeting concluded with an agreement that if the concept were successful, it would be made permanent by integrating the support group into the existing parent-teacher organization (PTO), which was active.

Following the orientation meeting, Jan contacted a group of parents about the program. She also contacted Col. John Miller (USAF, ret.) from the Kiwanis Club about his participation and help. Col. Miller, who is a member of Kiwanis' Manzano Sunrise Chapter, agreed to lend his organizational skills to help organize the committee. He also promised to provide other members of his club who, like himself, have professional technical experience, for judging and mentoring. In addition, Jan contacted some technical staff members from Sandia National Laboratories who had expressed an interest in the Self-Help Program and agreed to participate.

Jan organized the first SFVSC meeting, which was held in late September, 1991. She asked me to attend and to present the self-help orientation talk to the group. About ten people attended including parents, the principal, and community volunteers. After my presentation, and some discussion concerning some minor points, the group agreed to proceed with the program. At that time, the group formalized their organization by appointing Jan Lewis as the chairperson, and Irene Luckenhoff as secretary. Volunteers were identified for the major subcommittees: Logistics (Pauline Gutierrez), Judging

(Dave Ring), and Mentoring (Ron and Becky Pate). The SFVSC agreed to meet about every 10 to 14 days, or as needed, to serve the needs of the school's science fair.

Initial Events

Subsequently, the SFVSC met several times. After some discussion about the school's needs, they decided that a promotional event would be appropriate to kick-off the science fair activities. They also decided that an orientation workshop for parent and students was needed to help introduce the participants to the science fair and to provide materials about how to conduct a science fair project.

The promotional event, called the "Science Fair Blast-Off," was held early in the year. The purpose of the event was to inform parents about the goals of the science fair and to present the important dates. Previous science fair winners from Taylor presented their winning projects of past years. Teachers also presented information on science fair fundamentals.

The orientation workshop, which followed the promotional event, was patterned after a similar workshop that was held at Washington Middle School the previous year. The workshop was organized around a group of information stations, each of which would provide handout information on a specific science fair topic and be manned by an individual who was knowledgeable in the subject. Most of the technical experts were science teachers, parents, and community volunteers from local professional and civic organizations like Sandia, Honeywell, and Kiwanis. The subject areas included judging, selection of topics for projects, creating displays and reports, protocol requirements, special education needs, the scientific method, and the engineering method. A general station provided information on the school's science fair, including important dates and where to purchase science experiment materials. Blank science fair backboards were also for sale at this station. These backboards were sold at a profit and the proceeds were the primary source of revenue for the SFVSC throughout the year. In fact, these profits allowed the SFVSC to purchase all of the materials for the fair without requesting money from the school or the parent-teacher organization. Other materials, such as science fair books, were sold at no profit.

The SFVSC heavily promoted the workshop by handouts to students, flyers that were sent home to parents, notices on school bulletin boards, and daily announcements over the intercom.

The workshop was held immediately after the school day in the cafeteria and some adjoining classrooms. Each station was located in a separate area and contained a table with handout materials along with the technical expert who managed the station. The workshop was open to all Taylor students and parents, each of whom could attend the workshop at any time during its three-hour duration and stay for as long as desired. The attendees were free to roam from station to station and spend as much time as they felt necessary at each one. Refreshments, including coffee, soft drinks, and cookies, were provided throughout the workshop.

The materials available at each station were derived from the compendium of documents provided by Sandia (Menicucci, 1991). Other materials were derived from published documents, which are listed in the bibliography in Appendix B. Although some materials from the stations were given out to the attendees, most of the detailed information was used for reference only at the station. However, all of the information was bound into a single document, and several copies were placed in the school's library for checkout by students. Information from a publication by Fredericks and Asimov constituted a large part of the handout materials (Fredericks, and Asimov, 1990).

The workshop began with some general information about the science fair, which included a welcome by the school's principal, a short promotional video that was created by Sandia volunteers (Menicucci et al., 1991), presentations about the Self-Help Program, and a discussion of the fundamentals of conducting a science fair experiment. Some of these preliminary activities were videotaped.

About 75% of the attendees arrived at the workshop within the first one-half hour and attended the opening talks and presentations. However, because of the large number of attendees at the beginning of the workshop, many of the SFVSC leaders were concerned that some stations would be overcrowded and unable to properly attend to questions as parents and students competed for the attention of the station's technical expert. However, the free form of the workshop helped to mitigate the problem because the attendees tended to migrate to the less crowded stations, thus the loads on the stations were somewhat self leveling.

There was no formal survey about the effectiveness of the workshop. However, the anecdotal evidence indicated that it was effective. The technical experts who manned the stations reported many compliments. The science teachers who participated in the event also noted an increase in the level of interest among the students and parents. Also a number of positive comments were passed on to both the principal and the SFVSC members.

Additional Workshops

The success of the orientation workshop engendered an increased enthusiasm among the SFVSC members, which spread to many other parents and resulted in an increased participation in the SFVSC. The enthusiasm also led to a discussion of what future events should be planned, including other workshops. As a result, three additional workshops were planned: (1) a pre-fair mentoring workshop intended to help students while they were preparing their projects; (2) a judging workshop to train and orient the science fair judges, and (3) a post-fair workshop to help improve the projects of those students selected to participate in the next level of competition, the Regional Science Fair.

The pre-fair mentoring workshop was held about four weeks before the school fair, and its organization was similar to the orientation workshop. This workshop was also open for three hours following the close of school and included many of the same

stations as in the orientation workshop. Both parents and students were welcome to attend. Teachers, parents, and community volunteers again served as technical experts for the station. It is interesting to note that some of the volunteers were confused about the time of the event, and therefore did not attend. To remedy the situation, parents who were members of the SFVSC were called upon to fill the vacancies. In many instances, serving as a replacement was especially important in building the confidence of some of these parents who up to this point were not convinced that they had the ability to perform in this capacity.

The workshop was designed to respond to specific questions and problems that students were having at the time. The information stations were organized to emphasize group interaction between the technical expert and the attendees. For example, instead of each station containing a table of information, the station was a gathering place, with the technical expert at the center discussing problems with the attendees. Initially, the SFVSC was concerned that the groups at each station would become unmanageable because the numbers of questions and problems would overwhelm the technical expert. Another concern was that many of the attendees would become bored and discouraged waiting to air their particular concerns. However, neither problem materialized. Because many of the attendees had problems and concerns that were similar to the ones under discussion, working on a solution to a specific problem often applied to others in the group. In fact, many times the parents and students who attended the stations simply listened to the discussion for some time, took notes, and left without a question or comment.

Like the orientation workshop, there was no survey of this workshop's effectiveness. However, again the anecdotal evidence indicated that the workshop was appreciated and had met the needs of the attendees.

As a follow-on to the workshop, the SFVSC created a list of names and phone numbers of technical professionals who had agreed to help students with any problems that they were having in creating their projects. The list was given to all science students in the school. Students were encouraged to contact any individuals on the list during evening hours and on the weekends.

Subcommittee Activities

The momentum and enthusiasm of the SFVSC continued to grow, largely due to the success of the workshops, the organizational efforts of the SFVSC leaders, and the encouragement of the principal. At this time the science teachers' spirits began to rise as they realized the sincerity of the SFVSC and its vast potential to support the school's science education efforts.

Following the second workshop, the Logistical committee focused on organizing the science fair. Some of the problems that they discussed were where and how to procure tables for the projects, what prizes and awards should be provided, who should provide refreshments for students and judges, how to provide for the need for special

school-level recognition for all student participants, and when to schedule the science fair open house. A great deal of time was spent on many of these items, and in some cases, an ad hoc subcommittee was formed to address especially difficult problems. One such problem was the procurement of tables, which was difficult because the SFVSC initially believed that there were insufficient funds to rent the tables.

Concurrently, the Judging and Mentoring subcommittees were also increasing their planning activities. As the fair date approached, the judging organization assumed prime importance. The judging subcommittee was chaired by Dave Ring, a parent and former Sandia researcher. Several members of the committee had strong science and engineering backgrounds.

The subcommittee members had two principal areas of interest: (1) recruiting and training judges and (2) developing judging procedure and adopting judging criteria. These activities were divided among the subcommittee members. Dave Ring handled the recruiting and training, and John Hockert addressed the problems of the judging organization and criteria.

Dave Ring's team concentrated their recruiting on local technical organizations such as Sandia, the local Air Force Labs, and local private research organizations like Honeywell. They also recruited retired technical professionals through the Kiwanis Club; Col. Miller, representing the Manzano Sunrise Chapter, agreed to supply about 10 qualified judges. Dave's team also decided to conduct a judge's orientation and training workshop to be held just prior to the fair.

John Hockert's team focused on how the judging would be organized and the judging criteria. They decided to use the judging criteria that are commonly used by the regional, state, and international science fairs. They also decided on a two-stage judging process. The first stage of judging, which would occur in the afternoon of the first day of the fair, involves a review of all projects without the student present. After the review, the judges caucus and decide which projects warrant an interview with the student. This interview, which is performed the following day and is part of the second stage, is then used as the basis for determining the final scores, as well as those students who are selected to proceed to the next level of competition at the regional fair.

This two-stage process is required for two reasons. First, over 300 students were expected to participate in the science fair. However, there were only about 20 judges, which is far too few for the number of students. It is expected that each judge can interview and score about 10 projects, and it is preferable to have each project judged by at least two judges. Therefore, a minimum of 60 judges would be required. Second, often some projects do not represent serious efforts by the students. With the two-stage judging, the less serious projects can be easily identified and eliminated. Thus, the two-stage process allows the limited judging resources to be conserved for the more serious students.

The judge training and orientation workshop was conducted about a week before the fair and was attended by about half of the judges. Ron Guidotti, a Sandia researcher and very experienced judge, volunteered to discuss the fundamentals of judging at the workshop, including how to apply the judging criteria, how to conduct interviews, how to deal with sensitivities of children, and what were the fundamental considerations for a productive caucus. Ron answered specific questions from the attendees. Dave Ring followed with a discussion of the two-stage judging process. A summary of the basic information presented at the workshop is included in John Hockert's judging guide and was given to all attendees. The same materials were sent to the judges who did not attend the workshop.

In general, the organization of the judging at Taylor was exemplary. At all times the effort was professionally managed and focused on the students' needs. In terms of quality, this effort was comparable to most major fairs including regional, state, and international.

Science Fair

Taylor's science fair was conducted on February 19-21. About 295 students from the three grade levels elected to participate, which is approximately 140% more than the previous year and probably reflects the efforts of the SFVSC to increase awareness of the event and to encourage participation through the workshops. The students' projects were organized in categories that represented the major scientific and engineering disciplines. A medal was awarded to the 22 student competitors who were selected to proceed to the regional fair. Special ribbons were given to three alternates who were selected for the regional fair. All of the competitors were awarded a ribbon and a certificate of appreciation for their efforts. No other awards were given, and the projects were not ranked. This was a deliberate effort on the part of the SFVSC and the teachers to encourage student participation in the fair by focusing on the student's effort rather than the competitive aspects of the fair.

Post-Fair Activities

Following the fair, the SFVSC organized a post-fair mentoring workshop. This effort was managed by Jan Lewis with help from Ron and Becky Pate. The workshop was intended to help improve the quality of those projects selected to participate in the regional level of competition.

The Taylor mentoring workshop was held on a Thursday evening in the school's library several days after the fair. The 22 students selected for the regional competition and the three alternates were invited to set up their projects and be prepared to discuss the details with a technical expert (a mentor) who would suggest improvements. Both the student and his/her parents were required to participate in the mentoring sessions. The purpose for requiring the presence of the parents was to minimize miscommunication between the mentor and the student. The mentors who participated in the

event were recruited from the same organizations as the judges and, in many cases, included individuals who judged at Taylor's fair.

About two projects were assigned to each mentor. The mentors spent as much time as necessary to help guide the students in making improvements in the project or helping the students understand better the scientific or engineering principles upon which the project was based. The mentors, most of whom were experienced judges, also helped prepare the students for the rigors of the regional competition by conducting mock judge interviews.

Summary

In summary, the qualitative evidence suggests that SFVSC's efforts in support of Taylor's science fair program were outstanding. The committee exemplified all of the positive characteristics of a parent/community support system that is theorized in the academic literature. Moreover, many of the materials produced by Taylor's SFVSC are excellent reference documents for other schools (see Appendix D). Much of the success of the committee can be directly attributed to the very strong leadership of Jan Lewis, along with the talents and diligence of the team of parents and community volunteers who served with her. The principal's strong and unyielding support, along with the enthusiasm of the teachers, which grew steadily throughout the effort, also contributed to the committee's accomplishments.

Future Plans

The Taylor SFVSC has begun planning for next year's events. Their first objective is to critique this year's activities and assess the problems and areas of improvement. They also plan to identify the successes and how to maintain them. This self-assessment will be conducted over the summer months with the objective of reporting the results to the SFVSC in late August, just before the next school year begins.

An objective over the long term is to formalize the SFVSC by electing officers for two-year terms. Additionally, the SFVSC plans to appoint a steering committee, which will consist of community volunteers, former parents of the school, and technical experts. The steering committee will provide overall guidance and consulting to the SFVSC regarding the science fair, but will not be involved in the day-to-day business of the science fair process, which is the SFVSC's responsibility. The SFVSC believes that the steering committee will provide stability and year-to-year continuity. The continuity will be accomplished by allowing SFVSC members who have completed their term to serve on the steering committee, thus allowing their experience to continue to be used. Likewise, stability will occur through the guidance of a committee of competent and experienced individuals, the majority of whom will have no children in the school. Without this emotional attachment, they will, presumably, be better able to recommend to the SFVSC the best course of action for the school as a whole.

Washington Middle School

Background

After many years of absence, the tradition of parental involvement at Washington Middle School has only recently begun to be reestablished. Therefore, the Self-Help Program was seen as an opportunity to enhance this effort and, at the same time, support the administration's goal of creating a technology magnet school. As a result, the effort was organized and managed primarily through the school's science teachers.

At the outset of the Self-Help Program, which began through a meeting with me in early summer, the science teaching staff and the administration affirmed their commitment to the concept of the Self-Help Program and pledged to put forth a professional effort to achieve success, even if unpaid, out-of-hours work was necessary. They also expressed the hope that the Self-Help Program could help increase parent participation in the school through a parent-teacher organization (PTO) or one that is similar.

Rhonda Sandoval, the science department's chairperson, assumed the lead role in organizing and implementing the Self-Help Program. In this role, she not only chaired the SFVSC committee, but the Logistics subcommittee as well. Early in the school year, Rhonda recruited several parents to assist in the effort. Lynn Hightower, who has a technical background and is experienced with school science fairs, was one of the first parents to volunteer. She agreed to organize the judging and to assist with the logistics. Lynn recruited Theresa Nunez, a school parent who agreed to provide all of the typing and copying required by the committee. A short time later, two of the science teachers, Sue Gorman and Cherry Zielaskowski, agreed to organize the mentoring program. Rhonda also contacted and received pledges of assistance from some community volunteers including several from the Kiwanis Club and Sandia. These individuals constituted the core of the SFVSC.

Initial Activities

Rhonda organized several meetings of the SFVSC team to form a strategy for the school's science fair and how best to implement the Self-Help Program. Working in concert with the school's administration, the SFVSC adopted several goals for the year. First, they would work to increase the level of parental involvement in the science fair process. Second, they would encourage more student participation in the school's fair and would improve the quality of each project. Third, they wanted to improve the performance of the students who were selected to participate in the regional fair. And fourth, they would formalize and document the science fair process at Washington to form the basis for a sustainable science fair program and associated parent/community support activity.

One of the SFVSC's first decisions was to change the date of the school's science fair from its traditional time in February to December. The purpose of the change was

related to the goal to improve the performance of those students who would participate in the regional fair. A science fair that is conducted earlier in the school year would provide additional time to allow mentors to work with the students and improve their projects before the regional fair.

The decision to reschedule was somewhat controversial because parents and students were not accustomed to developing projects before Christmas and there was concern that the early date might discourage students from participating. There was also concern that the science teachers might feel uncomfortable in supporting the development of student projects in the short time-frame.

In response, the SFVSC decided to hold two workshops, one to orient parents and students in science fair basics and another to provide teachers with guidance about techniques for assisting and encouraging students in developing science projects.

This was the second year the parent and student workshop was held at Washington. Washington's teachers pioneered the concept of an orientation workshop in 1990, and they planned an enhanced and expanded event for 1991. One enhancement was to use part of the workshop to recruit parent and community volunteers to support the science fair. The two-hour workshop was scheduled for an evening in the middle of the school week.

Overall, the workshop plan was similar to the previous year's including a set of stations that would provide information about certain aspects of the science fair. Parents would be free to visit each station and to spend as much time as they felt necessary. The workshop was to begin with some short promotional presentations, including a welcome by the principal and the science teachers, a talk by me about the Self-Help Program, a short video about science fairs (Menicucci et al., 1991), a promotional video of Washington's 1990 science fair, and a short talk by Col. Miller, of the Kiwanis Club, about Kiwanis' commitment to support education. The committee also intended to upgrade and expand the material presented at each station and asked for my technical assistance in preparing it. Basically, the upgrades consisted of refining the information so that it was relevant to the needs of the students in preparing their projects. For example, one upgrade involved using sample projects at each station to illustrate the science fair concept being discussed.

The workshop contained five information stations, which included the scientific method, the engineering method, experimental design, design of reports and backboards, and judging. Each station was manned by a technical professional, usually the school's science teachers, who repeatedly presented short 15-minute talks about the subject area. Overhead (vugraph) projectors were used to enhance the talks with visual displays of the fundamental points being discussed. A question-and-answer period followed each short presentation, and paper copies of the vugraph displays were given to the attendees.

About 75 parents attended the workshop, which was surprisingly large considering that the event was held in the evening. Although no formal survey was taken to

measure the workshop's effectiveness, the enthusiasm of both the presenters and the attendees was obvious throughout the event. What is more, the workshop organizers received numerous verbal compliments. Also, many parents expressed their appreciation that the teachers had elected to support the event with no additional compensation. As a result, several of the parents volunteered to support the science fair through the SFVSC. Copies of the workshop materials are found in Appendix C.

The teachers' workshop (also called an "in-service training") was held about a week later. An important purpose of the workshop was to develop consistency in the educational methods used by the science teachers regarding the science fair. This 60-minute workshop was intended primarily for the new and/or inexperienced teachers. It began with a short presentation by some of the school's experienced science teachers about the fundamentals of a science fair. After the presentation, the bulk of the workshop was devoted to an interactive discussion in which the application of the scientific or engineering method was discussed. For example, in one exercise, different brands of chewing gum were distributed among the workshop attendees. They were asked to make observations about the gum and to discuss the observed differences among themselves. The workshop monitors then prompted the attendees to discuss hypotheses about what made the gum different and how their hypotheses could be tested. This graphical, hands-on exercise helped the attendees to better understand the fundamental process involved in a science fair project. It also helped to generate enthusiasm among the staff for the science fair.

Preparation for the Science Fair

The organization of the judging began at the same time that the workshops were being conducted. The effort was led by Lynn Hightower and Rhonda Sandoval. First they reviewed the judging organization from previous years. However, except for verbal accounts from teachers, records from previous years were scarce. For all intents and purposes, there was little useful historical information upon which to build. As a consequence, they proceeded to develop a new judging organization. They also made a commitment to document the effort so that their experience and developments could be further enhanced in upcoming years.

They asked Sandia for assistance in developing the judging, and I provided a number of pertinent documents about judging. I also attended several of meetings, each of which addressed specific topics related to the judging. Dick Wareham--a Kiwanis volunteer, retired Biology professor, and an experienced science fair judge--also assisted at some of the meetings. Some of the more important topics of discussion included establishing the judging criteria, the score sheets, judge recruiting, judge qualifications, and judging procedures.

Various judging criteria were considered for the fair including a look at some of the more uncommon ones used in other schools. However, the group finally decided that it was in the best interest of the students to keep the judging criteria consistent with the regional and state fairs so that students that progressed to these next levels

would not be subjected to a different set of criteria. The judging scoring sheets developed for the fair were also consistent with those used at the higher level fairs. Both the judging criteria and the scoring sheets were documented in a judging guide that was developed by the team.

The Judging subcommittee was also concerned with recruiting and organizing the judging so that they could handle a large number of students. Because of the encouragement by the science staff, many students were planning to participate. As a result, the subcommittee felt it was necessary to maximize the number of judges so that most or all of the students would have a chance to speak to a judge. However, they were also concerned with the quality of judging and believed that some minimal professional credentials were needed. This concern was particularly important because there were some reports that problems had occurred in previous years when some individuals who did not have proper judging experience had been allowed to judge. After discussion, the subcommittee agreed that the minimum qualification for judging was a bachelor's degree or equivalent in work experience. A background in science was preferred.

The subcommittee began identifying possible judges by calling professional organizations in the local area and asking for volunteers. They also contacted the Kiwanis Club. Again, Col. Miller agreed to supply judges and mentors. To follow the phone contact, the team created a solicitation package that contained a cover letter thanking the prospective judge and informing him/her about the time and place of the judging. Also included were a description of the judging criteria and the scoring sheets. The final item in the package was a questionnaire in which the potential judge was asked about his/her expertise and education. The questionnaire was to be returned to the SFVSC, who used the information to qualify the judge and, if qualified, assign him/her to specific projects. Copies of these documents are contained in Appendix C. The effort resulted in 20 judges volunteering to serve at Washington's fair.

Lynn Hightower assigned judges to the students' projects. On the day of the judging, each judge received an envelope containing information about the judging. The material included a copy of the judging criteria, a map of the project layout, a schedule of judging events, a list of the projects to which the judge was assigned, and a score sheet for each of the projects.

The total number of science fair projects (350) was far too large for 20 judges. However, many of the projects did not represent serious efforts by the students and were eliminated from the competition on the basis of the teacher's judgement. Therefore, the judging resources could be applied to the better projects.

This pre-screening was completed by the teachers the day before the fair. Those projects that were to be judged were placed on the tables in the school's gym. The others were set up below the tables. The projects were arranged in categories relating to most of the major science and engineering disciplines.

The judging assignments were made by matching each judge's expertise to the projects requiring judging. Each judge was assigned about 10 projects. In most cases, the judge's expertise was optimally matched to the content of the project. In a few instances, however, judges were assigned to projects outside their expertise. In these cases, they were encouraged to consult about the project with other judges.

Each score sheet contained a section in which the judge was asked whether the project was currently worthy to compete in the regional science fair. The sheet also asked whether the project had potential to compete at regional, and what improvements were needed to bring it to a competitive state. This information was used by the science teachers in selecting which projects would participate in the post-fair mentoring, with the intention that most would progress to the regional fair.

Science Fair

Washington's fair was held on a school day morning, December 11. Approximately 350 students elected to participate. To orient the judges about the process, a briefing was conducted about an hour before the judging started. Curt Mueller, a Sandia researcher and a regional science fair judging chairman, presented the briefing that included a discussion about how to apply the judging criteria, interviewing techniques, caucusing, and scoring. Refreshments, including coffee, juice, and doughnuts, were provided to the judges by the SFVSC. Rhonda videotaped the briefing for use in upcoming years.

The judges had the option of judging projects independently or in groups. The only requirement was that each judge must complete a score sheet for each project he/she was assigned to judge. The judging began by reviewing the projects without students present. If a judge chose to interview a student, he/she would contact Lynn Hightower, who would then dispatch a runner to fetch the student from the classroom. After the interview, the student returned to the classroom. Judges were encouraged to try to coordinate the interviewing so that the student would not be repeatedly called to the gym.

The judges did not formally caucus. However, many judges informally discussed projects of common interest. At the end of the judging period, all of the judges turned in their score sheets. Additionally, judges were asked to transfer their scores to a graphical scoring summary sheet, which was provided in their judging packet. This graphical summary sheet is similar to a bar chart and allows the magnitude of the scores to be represented by the distance from a common baseline. Thus, by placing these graphs next to each another, the scores of the projects can be visually compared.

The SFVSC, which consisted of many of the school's science teachers, used the graphical information and the comments from the judges to select about 35 projects to participate in the mentoring program. Of these, about 25 would eventually be selected to proceed to the regional science fair.

Ribbons were given to all participants to express appreciation for their efforts. Also, the SFVSC had decided to promote student enthusiasm by presenting a large number of awards. Therefore, first- through fifth-place ribbons were awarded in each category. Moreover, each science teacher was allowed to award several honorable mention awards to the students of his/her choice.

Post-Fair Mentoring Activities

After the fair, the Mentoring subcommittee began its task of identifying potential mentors and assigning them to the 35 students who were selected to participate in the mentoring program. The mentors were identified from the same sources as the judges and, in fact, many judges agreed to act as mentors.

The mentoring program was modeled after one that was used at Valley High School in Albuquerque, which was derived from one developed by Randi Buck, director of the Northwest New Mexico Regional Science and Engineering Fair.

Although only 24 students could be sent to the regional fair, 35 students were selected to participate in the mentoring program. Doing so exposed a larger number of students to the concept of mentoring; however the teachers also felt that the demands of the mentoring program would be sufficiently rigorous and that many students would reconsider their commitment to the program. Thus, they believed that as many as one-quarter would drop out as the program progressed, leaving about 24 students for the regional fair.

Eighteen mentors were recruited from the list of judges as well as other sources. Each mentor was matched to a student according to the judge's expertise and the type of project. The mentoring program was initiated through a meeting in which the students and their parents were introduced to the mentors. At the meeting, the teachers presented some guidelines about mentoring including the importance of commitment and follow-through. After the introductory comments, an informational packet was given to each mentor and student. Both were encouraged to stay after the meeting, introduce themselves to each other, and arrange for the time and place of the next meeting.

The teachers agreed to open the school each Saturday morning to allow the mentors and the students to use the facilities. Many of the mentors and students did avail themselves of this opportunity and regularly met at the school each Saturday. Others arranged for meeting elsewhere.

As expected, eleven of the mentored students dropped out of the program before the regional science fair. A total of 24 students completed the program and were awarded a trip to the regional science fair to represent the school. Two weeks before the fair, all of these students were invited to the school on a Saturday to participate in a group effort to develop backboards. The purpose of this activity was to provide all of the materials, tools, and expertise to create well-designed science fair display backboards. The materials included letters for creating titles and professionally

constructed backboard display frames. These frames are made of wood and are designed to easily accept cardboard inserts that contain the display. Two or three of these frames can be connected to form a science fair display. Other tools at the student's disposal were computers to create graphics as well as hand tools for lettering and cutting paper. Mentors and teachers provided guidance on constructing the layout.

On the final week before the fair, the students and mentors were invited to the last mentoring session in which mock interviews were to be conducted. In these sessions, mentors simulated judging interviews with the students and helped them improve their verbal presentations. The mentors concentrated on interviewing students other than the ones with whom they were involved.

In general the organization of the mentoring was one of the outstanding achievements of the Self-Help Program at Washington Middle School. The staff's dedication in preparing the materials, organizing the effort, and conducting the weekly mentoring sessions was a remarkable, professional effort.

Summary

In summary, the performance of Washington's SFVSC, particularly the science teachers who were involved, was superb. The professionalism of the teachers in developing the SFVSC and its related activities was the most noteworthy aspect of Washington's program. The expertise of the parents and community volunteers, which was delivered with a great deal of enthusiasm, was also an essential element in the success of the effort. In total, the innovation and productivity of the SFVSC were excellent. They pioneered the concept of the science fair workshop for students, parents, and teachers. They also developed an extensive community-based mentoring program to assist those students who were selected to compete at regional science fairs. Moreover, all of their major goals were met. The program led to increased parental involvement. They improved the level of student participation, and the mentoring program helped improve the quality of the projects that were sent to the regional fair. Finally, the effort was carefully documented so that the experiences can be used to improve the science fair support activity in upcoming years.

Future Plans

The SFVSC is planning to continue its efforts next year. A primary goal is to increase parental involvement in the science fair process by encouraging all parents, especially parents of sixth graders, to involve themselves in the SFVSC. Sixth-grade parents are considered a key to a sustainable program because they will be involved with the school for the longest period. At the beginning of the school year, the teachers plan to call a meeting of sixth-grade parents to introduce them to Washington and during the meeting will recruit members for the SFVSC. All of the volunteer names will be placed on a computerized database for use during the school year.

The school also plans to encourage more of the students who participate in the invention convention to participate in the science fair. Although invention convention is a productive activity, some feel its rewards are limited because it is a non-competitive event and does not require the discipline of a science or engineering project. However, often a good invention convention project can be converted to an engineering project with a modest amount of work. The project can then be entered in the science fair and compete for awards. To promote the idea of converting the invention project to a science fair project, the school will hold the invention convention early in the year, followed by the science fair in January. Thus, sufficient time will be available to identify worthy invention projects and help convert them to science projects.

Finally, the school is considering creating a science club to promote both interest in science and the continued involvement of community and parental volunteers. These volunteers would form a pool of human and social capital that can serve as resources for the school community.

St. Charles Borromeo School

Background

The Self-Help Program began at St. Charles in September, 1991. In the initial stages the principal, Doug Price, was the main point of contact. Doug arranged a first meeting of interested parents and the science teacher. He asked me to present the self-help concept to the group and to discuss the program with a special emphasis on how it could benefit the students, teachers, and parents.

The parents who were invited to attend the meeting were identified through a computerized database management system that is used by the school's parent-teacher organization (PTO). The database contains basic information about each parent (i.e., name, address, phone number, profession, other expertise, etc.) along with a notation about the school's volunteer activities that he/she has agreed to support. The school encourages parental involvement and assesses $25 per year for those who choose not to volunteer their time. The parents who agreed to attend the meeting were among those who had elected to volunteer their time in support of the science fair. A copy of the information sheet used to gather the raw data about each parent is found in Appendix E. The information on this sheet is input into the APPLEWORKS database computer program, which is run on the school's computers.

Initial Meetings

The meeting was held in the late afternoon on a school day. Attendees included Doug Price, the science teacher, and two parents. Originally, about six parents had agreed to attend, but family emergencies prevented them from doing so. I presented the Self-Help Program to the group. There were some initial concerns by the science teacher about the structure of the program, particularly the degree of control the SFVSC

would have over the science program in general, and specifically the teacher's plans for the science fair. After a long discussion, she was convinced that the program would be tailored to assist her in the manner in which she is most comfortable. In general the group, and especially Doug Price, believed that the program held much potential for the school and agreed to proceed with it. However, none of the attendees volunteered to lead the development of a SFVSC at the school.

Doug Price and I met privately several days later to discuss the meeting. The main concern was the absence of a leader for the SFVSC. We agreed to call another organizational meeting of the parents in an attempt to broaden the interest in the program and to try to identify a parent leader. I agreed to send a letter of invitation on Sandia letterhead to a group of parents that would be identified by Doug. This group included all of the parents of sixth-, seventh-, and eighth-grade students, along with those parents who agreed to support the fair. Doug also agreed to place a notice of the meeting in the school's newsletter and to use his personal influence to encourage attendance at the meeting. We agreed to request community support from the Kiwanis Club. Col. Miller, from the Kiwanis' Manzano Sunrise Chapter, pledged to provide organizational and technical consulting. All of the letters and notices were delivered and posted, and the meeting was scheduled for an evening in early October.

Seven parents attended the meeting along with Doug Price, Col. Miller, and me. Doug opened the meeting with a short speech about the importance of the science fair and the value and necessity of parental involvement in maintaining the school's tradition of quality. He also stated a goal of integrating the SFVSC into the school's PTO to help insure that its functions would become permanent. He summarized by encouraging all of the parents to become actively involved in the SFVSC. Col. Miller spoke briefly about the Kiwanis' commitment to education and particularly to the science fair. He outlined the resources he could provide to the school including organizational consulting, judges, mentors, and financial help. I followed the speeches with a presentation about the Self-Help Program and encouraged the formation of the three major subcommittees (Logistics, Judging, and Mentoring).

Three parents volunteered to lead the subcommittees. One couple agreed to co-manage the Logistics committee. Another individual parent agreed to lead the Judging. There were no volunteers for the Mentoring. But more important, no one volunteered to lead the SFVSC. At Doug Price's request, I agreed to serve as the committee coordinator on a temporary basis until a leader could be identified. Col. Miller agreed to serve as a consultant on all three subcommittees. All of the other parents in attendance agreed to support the subcommittees in some fashion.

Shortly after the meeting, the chairperson of the Judging subcommittee was permanently transferred out of town by her employer and so was forced to resign from the committee. Another parent was identified to assume the duties as chairperson of the Judging subcommittee.

Subcommittee Activities

The Logistics committee was the most active and met regularly to discuss the most important problems as identified by the science teacher. These included the selection of the type of awards to present and the procurement of tables, which apparently is a problem for most schools. The subcommittee was also involved in coordinating the fair, planning it, copying documents, and communicating the committee's activities to the school community.

The SFVSC met as a group to discuss its goals and objectives. However, there seemed to be a problem in maintaining parental interest. For example, two parents who attended the second organizational meeting and who had volunteered to help, did not attend any subsequent meetings. Thus, some of the committee's efforts were devoted to seeking new members. The committee decided to place a solicitation notice in the school's newsletter and to make an announcement at the school's next PTO meeting.

The solicitation efforts resulted in acquiring three new members. However, the Mentoring committee chair remained open. What is more, the job of SFVSC chair remained unfilled, which required me to continue to act as temporary coordinator.

Initial Events

After consulting with the science teacher, the SFVSC decided that a parent-student orientation workshop would be beneficial, especially to sixth-grade students who were about to engage in their first science fair and their parents. (Students in grades K through 5 are required to participate in a non-competitive invention convention.) Since the science fair is a mandatory part of the school's science curriculum, the SFVSC and the science teacher felt that the workshop should be aimed toward those students who are not disposed toward science and who traditionally view the fair as a difficult, confusing, and burdensome process.

The workshop was structured very much like the ones that were conducted at Washington and Taylor Middle Schools. The workshop was held immediately after school on a Thursday and ran for about three hours.

The workshop began with a short introductory period in which all of the initial attendees gathered and listened to some brief comments by the principal and some of the SFVSC members, and introductions of all of the technical experts who would be manning the various information stations. I presented a short talk about the Self-Help Program and encouraged volunteers to serve. A promotional video about the science fair was also shown (Menicucci et al., 1991). (The video, which was very popular, was shown about every 20-30 minutes throughout the duration of the workshop.)

The workshop contained the following stations: How to select topics for projects, how to create a backboard display and report, an explanation of the scientific and engineering method, and an overview of the judging process. The stations were manned

by parents and community volunteers from Kiwanis Club and Sandia. I provided detailed technical materials for use at each station. The material was taken from the compendium of science fair documents that I had assembled (Menicucci, 1991). The committee used this information to create handout packets at each station. A significant number of handout materials were taken from a publication by Fredericks and Asimov (1990). Most of the packets contained about 20 pages.

The SFVSC had anticipated attendance of about 20 to 30 families. Therefore, although the informational packets contained a significant amount of detail and, collectively, totaled to over 100 pages, the committee felt that it was feasible to provide a complete copy to each family that attended the workshop as well as providing some spares for those who could not attend. They also planned to collect all of the information into a single bound document for inclusion in the school's library.

The actual attendance at the workshop was about two to three times the expectation. Nearly 60 families (about 45% of the 6-8 grade families) attended, with more than half of them present at the beginning of the event. As a result, the handouts were exhausted within the first 20 minutes of the workshop. Since the SFVSC had advertised that all attendees would receive "handout information," a sign-up sheet was provided to identify those parents/students who did not receive the handout package. Additional copies were promised within a week.

The workshop was very successful. Nearly everyone who attended the event extolled its benefits and commended the efforts of the SFVSC. The SFVSC also surveyed the attendees to quantify their feelings. The results of the survey show general satisfaction with the workshop's format and the information they received. The only problem, which was repeatedly cited, was the shortage of handout materials. A copy of the survey and a report are found in Appendix E.

The workshop's large parent/student turnout created a budget problem for the SFVSC. Copies of the handout materials were donated to the school by a private business. However, the same donor was unable to supply the additional copies for free. Thus, the committee was forced to expend funds to purchase the copies. The problem was that the committee's budget was fixed based on the previous year's science fair activities, which did not include money for copying documents. After some discussion, Col. Miller solved the problem by arranging for the Kiwanis Club to donate the money for the additional copies. Three copies of all of the handouts were also bound and placed in the school's library.

At the following SFVSC meeting, the members reviewed the problem regarding the handouts and possible solutions for next year. The committee decided that handouts are an important and valuable feature of the workshop, but that they were too voluminous to copy for every attendee. Therefore, they agreed to condense the essential information into a smaller set of handouts. Several individuals on the SFVSC volunteered to create the new handouts. The results of these efforts are found in Appendix E.

Judging Activities

The SFVSC began planning the judging activities. After consulting with the science teacher, the committee decided that the judging would roughly follow the format used the year before. However, in the past there had been difficulty identifying a sufficient number of judges with the appropriate backgrounds. This year the committee agreed to vigorously solicit judges from professional technical organizations and companies, parents, and community groups like Kiwanis. They also agreed that to maintain quality, all judges would be required to hold at least a bachelor's degree and some professional experience in a technical organization. A strong preference would be given to those with degrees and experience in science or engineering.

Since student participation in the science fair is mandatory, the number of exhibits was precisely known. The committee estimated that about 20 judges were needed. A sufficient number of volunteers, many of whom judged at St. Charles the previous year, committed themselves about two weeks before the fair. The committee also discussed the judging criteria. Since the criteria that had been used at St. Charles were similar to those used in the regional and state fairs, the SFVSC recommended no changes. However, after some discussion, the committee decided not to pre-assign judges to the student projects before the fair. Pre-assignments, which are often done a few days before the fair, are common in science fairs and allow the expertise of each judge to be more carefully matched to the needs of the various projects. However, the committee believed that this task could be best accomplished during the judge's orientation briefing on the day of the fair so that the wishes of the judges could be considered.

The chairperson of the Judging subcommittee agreed to prepare and conduct the judges orientation workshop. I supplied some basic technical materials and a videotape for use in the preparation. The chairperson planned the orientation to include a discussion of how to apply the judging criteria, how to interview students, and how the judging is organized and conducted.

The SFVSC, after consulting with the science teacher, decided that the student exhibits would be grouped according to classes. There are two classes per grade level, i.e., two sixth-grade classes, two seventh-grade classes, and two-eighth grade classes. Within each of the six groups, the exhibits would be divided into three categories: biological sciences, physical science, and engineering. First-, second-, and third-place awards would be given to students in each of the six groups, regardless of the category. No overall science fair winners would be selected.

The judging was organized to conform to the layout of the student projects. A team of judges would be assigned to each grade level, with one individual selected as chairperson. Each team would first review all of the projects without students present. Following the review, the judges would caucus and develop preliminary rankings. During the caucus, the students would arrive at their exhibits, and each would then be interviewed by at least two judges. The judges would caucus and finalize the rankings

and select the top three winners. They also were to rank order all of the exhibits in the group for use in selecting those students who would proceed to the regional fair. In general, the chairperson in each group was responsible for developing and managing the exact procedure for reviewing and interviewing (e.g., judging in groups or individually). The last caucus of the day was to involve the chairpersons from each grade level along with the science teacher, and its objective was to select the projects that were to proceed to the regional science fair.

About six weeks before the school fair, the SFVSC met more frequently, or about every ten days. Also, a parent volunteered to oversee the mentoring activities. However, membership on the SFVSC was tenuous, and attendance at the meetings was sporadic. Some of the parents who were initially involved with the committee had apparently lost interest and were not active. At this time, the SFVSC consisted of five parents and Col. Miller from Kiwanis, which was a reduction from about a month earlier when about 10 volunteers had committed to support the SFVSC. Most important, the SFVSC still had no leader and I continued to act as a temporary coordinator.

There is no clear explanation for the apparent waning interest among the members at this time. However, I believe it is related to the absence of a committee leader, a role that requires a dedicated parent volunteer. Another possible explanation is that many of the volunteers may have had unrealistic expectations about the level of effort required to initiate the SFVSC, which may have caused some of them to become discouraged. In my capacity as a technical advisor, it was inappropriate for me to assume this leadership role.

Another factor was a growing problem with the SFVSC's relationship to the school's PTO. The PTO leaders were apparently resistant to the idea of accepting the SFVSC as a standing committee. Not only did this situation have a noticeably degrading effect on the morale of the SFVSC, it also hampered the SFVSC's access to the large pool of human and financial resources that were available within the PTO.

Mentoring Hotline

After consulting with the science teacher, the SFVSC decided that some pre-fair mentoring would be beneficial. The purpose of the mentoring was to assist those students who were in the final stages of their experiments and/or preparing their displays or reports. Rather than a workshop, the committee agreed to form a Mentoring Hotline that would allow students to contact the mentor directly to discuss a specific problem. If warranted, the mentor and student could arrange to meet. A list of potential mentors was developed by the Mentoring subcommittee chairperson. This list identified the name of the mentor, his/her expertise, and the times and dates he/she would be available to consult. One of the SFVSC members agreed to act as the point of contact for the mentoring. This job would involve directing the students to the appropriate mentor. For example, students who desired help could call the point of contact and explain their need. Based on the information on the list of mentors, the point of contact would identify an appropriate mentor and then give the mentor's name

to the student, who could then contact the mentor directly. The purpose of this arrangement was to help insure that a mentor with appropriate expertise was matched to the student's needs and to prevent any one mentor from being overworked. Students were asked to restrict their queries and interactions with the mentors to the hours of 7 p.m. to 9 p.m., Mondays through Thursdays.

The Mentoring Hotline was advertised in the science classes and the school newsletter. It was initiated about one month before the school fair and was maintained for two weeks. During this period, the hotline answered about five student inquiries, two of which required interaction with a mentor. The SFVSC discussed at length the apparent lack of student interest in the hotline, but they never agreed on an explanation. I believe that the small number of queries indicates that the science teacher may have been providing all of the necessary technical support to the students and that no additional help was needed. This is consistent with one of the major intentions of the Self-Help Program, which is to help free the teacher from the logistical duties of the science fair so that more time can be spent teaching science. Another explanation is that the parent/student orientation workshop was successful in preparing the students for the science fair process.

Science Fair

The school's fair was held February 7. Approximately 150 students participated as required. At the outset, there was some difficulty organizing the judges because several arrived late. These late arrivals created problems because the orientation speech had to be restarted several times to accommodate the tardy judges, some of whom were 25 minutes late. There were also problems in attempting to form the three judging teams during this preliminary orientation period. The problem was that the expertise among the judges varied considerably; some judges were engineers, while others were biologists. Furthermore, some judges had very extensive judging experience while others had none. There was an effort to balance the judges' expertise and experience among the three grade levels. However, this is a time-consuming task and difficult to accomplish in the time allocated. The problem was compounded by late-arriving judges, which required the groups to be continuously reorganized as new judges checked in. However, after these initial problems were resolved, the judging itself was reasonably well executed.

Post-Fair Activities

The SFVSC met after the fair, and four parents were present. Also in attendance were the science teacher, Col. Miller, and myself. The group could not agree about how to proceed regarding post-fair mentoring. They finally concluded that there were insufficient time and resources to pursue such a mentoring program. They did agree that post-fair mentoring is valuable and committed to pursue it next year. The committee also agreed that they should concentrate their efforts during the remainder of the school year to gaining acceptance as a standing committee within the school's PTO. It was obvious that the PTO's apparent rejection of the SFVSC was a source of serious frustration to the members. No other science fair activities were planned, and the

committee agreed to meet on an ad hoc basis as needed to discuss the situation with the PTO.

Future Plans

The SFVSC feels that it provided valuable support to the school that was appreciated by the science teacher, students, and parents. The committee plans to enhance its effectiveness initiating its activities earlier in the year. For example, committee representatives will contact the science teacher in August to determine how the committee can best help the school's science fair program. Moreover, the SFVSC has secured a leader and an effort is currently underway to recruit more parents into the organization.

At present, the SFVSC will repeat and, if possible, improve the orientation workshop and the Mentoring Hotline. One improvement is to provide a more concise set of handouts for the workshop. Another is to develop ways to increase the student's awareness and use of the Mentoring Hotline.

The SFVSC also plans a more comprehensive mentoring program. No decisions have been made about whether mentoring should be provided to all of the school's science fair students prior to the school's fair, or whether the mentoring should be provided only to those students who are selected for the regional fair. The committee is considering providing both types of mentoring, probably through group activities such as workshops.

Another SFVSC goal is to better use available resources. Community volunteers, especially retirees within the parish, are one of the human resources that will be tapped. Another resource is the school computers, which will be made available to the science fair students next year.

Finally, the SFVSC members believe that their activities support the school's core curriculum. Consequently, they believe that the SFVSC should be a PTO standing committee, and they are committed to their struggle to achieve this objective. Their plan to gain acceptance into the PTO involves two steps: (1) use public speeches at the regular PTO meetings to develop public support for accepting the SFVSC as a PTO standing committee, and (2) use the public support to secure a vote to accept the SFVSC into the PTO. The SFVSC has initiated this plan with a letter to the PTO president outlining the benefits of the SFVSC as a standing committee. A copy of the letter is included in Appendix E.

Summary

In summary, the SFVSC at St. Charles was productive and innovative. They effectively used their existing parent database system along with written records from previous years to identify parents to serve on the committee as well as other assets for use in the science fair. They produced a very well organized parent-student orientation

workshop and developed a concise set of handout materials. Their Mentoring Hotline was also unique, and its structure will probably be duplicated in other schools. Additionally, the committee used the community resources very well by integrating the services of the Kiwanis Club into both its organizational activities as well as its judging and mentoring. Finally, the principal was supportive throughout the effort and provided encouragement and appreciation for the involvement of all the members. He is also committed to the concept of a permanent SFVSC and has pledged his support toward its realization.

The science teacher was very pleased with the efforts of the SFVSC. This teacher commented that the quality of the projects had improved from the previous year and that the process was better organized. The teacher also believed that as a result of the workshop, the parents felt more comfortable with the process. It also may be of some importance to note that of the 18 students who were sent to the regional fair, six were category winners, and three were selected to proceed to the state fair. These numbers were an improvement over the previous year and, according to the science teacher, may reflect the positive influence of the SFVSC.

Discussion of Problems

The SFVSC did, however, have two major problems that affected its overall productivity. First, the SFVSC never secured a leader from the school community. As a result, I was compelled to act as its coordinator throughout the year, which was not the best situation. Because of my position as a technical advisor from Sandia, and because the Self-Help Program is designed to develop a community-based support process, it was inappropriate for me to lead the committee. Furthermore, I was uneasy about assuming too prominent a position because I feared it would discourage other potential leaders from emerging. Therefore, my actions as the SFVSC's temporary leader were constrained. The lack of a school community leader created a liability for the committee that hampered its decision processes.

It is not clear why a SFVSC leader never emerged from the school community. However, Doug Price has forwarded several possible explanations: (1) there may have been fear of the responsibility of leading a new activity, (2) there may have been no individuals with the appropriate expertise to handle the job, or (3) a combination of both of the reasons noted above. In any case, Doug's belief in the importance of the SFVSC prompted an intensive effort to identify a leader. As a result, one parent has agreed to lead the SFVSC next year.

The second problem was the PTO's reluctance to accept the SFVSC as a committee within its organization. At the outset of the Self-Help Program, it was widely assumed that the SFVSC would become a committee within the PTO. The SFVSC members were naturally enthusiastic about developing a novel support activity within the school that would be sanctioned by the PTO. They also anticipated accessing an appropriate portion of the PTO's budget to create an innovative science fair support program. When it became apparent that the PTO was not inclined to accept the SFVSC as a standing

committee, the morale of some of the key members of the committee was noticeably degraded. Moreover, as time passed, the PTO became an increasingly dominant topic of conversation, which distracted the members from the most important matters regarding the support of the science fair. I believe that this matter not only depressed enthusiasm but was also the cause of many minor problems throughout the year such as the sporadic parental involvement.

The situation was viewed differently by the PTO's leaders. Soon after the SFVSC began requesting committee status in the PTO, the PTO president expressed to Doug Price his concern that admission of the SFVSC as a standing committee would set a precedent for other activities to be so sponsored. Accommodating such committees was beyond the duties that the president considered the PTO should assume. The PTO president later modified his position and became more willing to consider the possibility. It is also important to note that the PTO recently elected new officers, all of whom have expressed strong support for accepting the SFVSC as a standing committee. The SFVSC inclusion into the PTO seems reasonably certain next year.

As noted above, the SFVSC is continuing to work toward solutions with the goal of developing a permanent science fair support activity for the school. These experiences, although painful, can build community relations and provide the basis for a very sound and permanent organization. Additionally, they also render valuable lessons that can be used by other schools and educational communities.

6. Quantitative Measures of the Effectiveness of the Self-Help Program

I measured the effectiveness of the Self-Help Program with a two-page survey. The primary purpose of the survey was to measure the perceived overall value of the Self-Help Program in the school's science fair process. I also used the survey to identify some of the philosophical attitudes towards the science fair and to solicit comments about how the school's science fair program might be improved. Finally, the survey asked about my effectiveness in providing organizational and technical help to the SFVSC, which was one of my primary roles in the pilot program.

Development of the Survey

The surveys were developed with expert assistance from Tech Reps, Inc. in Albuquerque, a technical research and development company with much experience in this area. Their assistance ranged from consultations about the wording of the questions to the details of the survey layout. They also assisted in pilot testing certain questions to determine whether the intent of the question was properly conveyed. To do this, they used parents and ex-teachers who are currently on their professional staff.

Three versions of the survey were created for: (1) science fair students, (2) their parents, science teachers, and administration, and (3) community volunteers. Copies of the surveys are found in Appendix F. The same basic material is presented in each; the versions differ in the type of wording used and the appropriateness of the questions for the specific audience. For example, community volunteers were asked if they felt appreciated for the time and effort they gave to the schools in which they were involved. Certainly, this is an inappropriate question for science fair students. Likewise, parents, teachers, and administrators were asked if they believed their school's science fair program needed improvement before the Self-Help Program was implemented; this question is inappropriate for community volunteers.

The questions on each type of survey were designed to elicit information in five categories: organizational information, philosophy, effectiveness of the Self-Help Program in addressing school needs, effectiveness of the SFVSC, and effectiveness of my technical and organizational help. Each category is discussed below. Some questions outside these categories were included to provide ancillary information for more refined analysis or investigation, if needed. For example, question number 9 on the community volunteer survey, which asks about the level of appreciation from the school, was inserted to serve as an indicator of a potential problem at a specific school involving volunteers. Another example is Question 12 on the parent survey, which is a more refined version of Question 8.

1. **Organizational information.** These questions elicited information about the school or schools with which the individual was involved, the nature of his/her

involvement, and whether the science fair was part of the curriculum. This information was used to help organize and sort the surveys during the analysis of the responses. For example, the school name was used to help identify all of the community volunteers who were involved with that school. Their responses can then be compared with the volunteers who were involved with another school.

Outlined below are the questions by number that relate to *organizational information* on the survey.

Community Volunteer Survey: Question # 1, 20
Adminstrator/Teacher/Parent: Question # 1, 2, 19
Science Fair Student: Question # 1, 18

2. Philosophy. The questions regarding philosophy were intended to identify how participants in the science fair and/or science fair process felt about the science fair. Although these questions did not relate directly to this year's Self-Help Program, I thought that they might provide insightful information that would be valuable for the program's further improvement. Specifically, I wanted to know whether the current program was philosophically congruent with the needs of the program's constituents. For example, the self-help program was designed with the assumption that the science fair is a group learning event that is viewed as more of a social activity, than a competitive one. Further, I assumed that community and parental involvement is universally valued and that a self-help program, such as this one, would be welcomed in any school community.

Some of the questions in this group were easily defined. For example, on all three surveys, one open-ended question asked the respondent to define the *primary goal of the science fair*. The question about the goal of the science fair is listed below:

Community Volunteer Survey: Question # 3
Administrator/Teacher/Parent: Question # 3
Science Fair Student: Question # 2

Multiple choice questions asked about the *perceived value of parental and community involvement in supporting school science fairs*. The multiple choices ranged from "no value" to "high value." Other questions, which required a yes or no answer, asked about the *appropriateness of a Self-Help Program in other school settings*. These questions are identified below:

Community Volunteer Survey: Question # 12, 16, 17
Administrator/Teacher/Parent: Question # 10, 14, 15
Science Fair Student: Question # 9, 13, 14

Some of the most important of the philosophy-related questions were very difficult to design. These questions concerned how the science fair is perceived and its educational focus. Specifically, I wanted to know the degree of competitive seriousness

in which the science fair is viewed and how that contrasts with its social aspects. I also wanted to investigate views about student participation, particularly in regard to mentoring. Some schools have developed very intensive mentoring programs for a limited number of student participants. The Self-Help Program tends to encourage a large number of participants, all of whom are mentored in a group setting.

I had two concerns in designing the survey questions to measure these views. First, I wanted to insure that the questions were not biased, which would lead the reader to certain responses. Second, although there are extreme positions in each of these areas, I feared that if the question was constructed as a multiple choice, most people would avoid the rigors of a self-evaluation about the pros and cons of each extreme and simply respond near the middle, thus diminishing the possibility for a clear conclusion. To avoid this problem, I decided to construct the question with only two choices, each representing an extreme position. The respondent would then be forced to carefully weigh his/her response.

The questions used to *assess the views about the competitiveness of the fair and the preferences about mentoring* are identified below:

Community Volunteer Survey: Question # 4, 5, 6
Administrator/Teacher/Parent: Question # 4, 5, 6
Science Fair Student: Question # 3, 4, 5

3. Effectiveness of the self-help program in addressing school needs. These questions asked *whether problems were perceived in the science fair process before implementation of the Self-Help Program* and *how effective the SFVSC was in addressing the problems.* Related questions asked *how effective the Self-Help Program was in identifying and using parental/community resources, and helping to form the SFVSC.* (Note that these last two questions are not included in the community volunteer's survey because they were accidentally omitted.) These questions are identified below:

Community Volunteer Survey: Question # 7, 13
Administrator/Teacher/Parent: Question # 7, 8, 9, 11
Science Fair Student: Question # 6, 7, 8, 10

4. Effectiveness of the SFVSC. A single question addressed this concern in which the respondent was asked to *rate how well the SFVSC supported the school's science fair process in the three principal areas of logistics, judging, and mentoring.* The multiple choice question, which was actually three questions in one, is identified below:

Community Volunteer Survey: Question # 15
Administration/Teacher/Parent: Question # 13
Science Fair Student: Question # 12

5. Effectiveness of the Sandia's technical and organizational help. These questions asked the respondent to *rate my effectiveness in providing technical and organizational support to the SFVSC*. The questions, which consisted of multiple choice answers, are identified below:

Community Volunteer Survey: Question # 18, 19
Administrator/Teacher/Parent: Question # 16, 17
Science Fair Student: Question # 15, 16

6. Comments and suggestions. At the end of each survey, the respondent was asked for comments and suggestions about the Self-Help Program.

Results of the Survey

The surveys were distributed to each school and one individual at the school was responsible for disbursing and retrieving them. The surveys were in the field for two weeks. Table 1 outlines the number of surveys returned.

I reviewed each survey individually. I removed those that were substantially incomplete (greater than about 75% blank) as well as those that contained profane comments, because I considered that these surveys did not reflect serious or thoughtful responses. About 12 surveys were removed, which represents about 2% of the total number of surveys returned. I then consolidated the surveys into four groups: a group corresponding to each one of the three schools, and a group for community volunteers. Within each school group, I further divided the surveys into sub-groups of parents of science fair students, parents involved with the SFVSC, students, and teachers/administrators. The intention was to compare and contrast the results of the major parts of the survey among each sub-group at each school. However, the sample of the parents involved with the SFVSC was too small to allow a meaningful statistical analysis. Therefore, all parents were analyzed as a group at each school, regardless of their affiliation with the SFVSC.

The sample of teacher/administrators returning surveys was also limited and therefore all teacher/administrators were grouped regardless of school affiliation.

The number of student surveys returned provided a sufficient sample to allow this group to be analyzed at Washington and St. Charles. But no surveys were returned by Taylor students.

The final grouping resulted in: (1) parents analyzed as group within each school, (2) students analyzed as a group within each school, (3) all teachers from all schools analyzed as a group, and (4) community volunteers, analyzed as a group, regardless of the schools in which they were involved.

Table 1. Total Surveys Returned

Surveyed Group	Surveys Returned
Taylor Parents	97
Taylor Students	0
Washington Parents	68
Washington Students	139
St. Charles Parents	35
St. Charles Students	125
Community Volunteers	15
Science Teachers	13

The total responses were tabulated for each question on the survey for parents and students within each of the three schools. Similar tabulations were made for each question for the teachers and community volunteers.

The raw totals for some of the most important questions are included in the tables in Appendix G. However, because of the variation in the size of the population at each school, as well as the differences in sample size, these totals alone are not very useful. At best, only some broad trends can be observed. Additionally, since I considered the opinions of the four major groups of participants (parents, students, teachers, and community volunteers) to be equally weighted, it is especially difficult to use the raw totals to perform this comparison.

To solve this problem, I converted the raw totals to percentages by category. Tables 2 through 6 contain the results for the five major categories of questions: philosophy (Table 2), science fair values (Table 3), Self-Help Program Effectiveness (Table 4), SFVSC effectiveness (Table 5), and my effectiveness (Table 6). I also computed the average percentage for all parents and for all students for the questions in each of the categories. These two averages, which represent the collective views of parents and students from all the schools, are found in the tables. The "average percentage of all respondents" was computed by averaging the percentages from the following four rows labeled: "Average percentage all parents," "Average percentage all students," "teachers," and "community volunteers." A detailed description of each table is provided below.

Table 2. Philosophy Regarding Science Fair
(Percentage of responses)

	Serious Competition	Fun Learn	Competition & Winning	Enjoy Experience	Individual Mentoring	Group Mentoring
Taylor Parents	7	93	10	90	20	80
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	26	74	28	72	27	73
Washington Students	24	76	33	67	42	58
St. Charles Parents	17	83	3	97	0	100
St. Charles Students	21	79	13	87	15	85
	--	--	--	--	--	--
Average percentage, all parents	17	83	14	86	16	84
Average percentage, all students	23	77	23	77	29	71
Community Volunteers	18	82	23	77	0	100
Science Teachers	9	91	18	82	0	100
	--	--	--	--	--	--
Average percentage, all respondents	17	83	20	80	11	89

Note: The numbers for the corresponding survey questions are as follows:
Community Volunteers, #4, 5, 6
Admin/Teacher/Parent, #4, 5, 6
Student, #3, 4, 5

Table 3. Science Fair Values
(Percentage of responses)

	Value of Parent & Community Involvement		Self-Help Program Appropriate for Other Schools?		Self-Help Program Appropriate for Other Grades?	
	High or Some	Little or None	yes	no	yes	no
Taylor Parents	82	18	95	5	94	6
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	82	18	94	6	100	0
Washington Students	65	35	78	22	82	18
St. Charles Parents	100	0	100	0	92	8
St. Charles Students	92	8	92	8	90	10
	--	--	--	--	--	--
Average percentage, all parents	88	12	96	4	95	5
Average percentage, all students	78	22	85	15	86	14
Community Volunteers	100	0	100	0	100	0
Science Teachers	69	31	88	12	100	0
	--	--	--	--	--	--
Average percentage all respondents	84	16	92	8	95	5

Note: The numbers for the corresponding survey questions are as follows:
Community Volunteers, #12, 16, 17
Admin/Teacher/Parent, #10, 14, 15
Student, #9, 13, 14

Table 4. Self-Help Program Effectiveness (Percentage of Responses)

	Science Fair Process Needed Improvement?		Self-Help Program Help Use Parent Community?		Self-Help Program Help Create SFVSC?		How Much Did SFVSC Make the Necessary Improvements?	
	yes	no	yes	no	yes	no	Great/Some Improvement	Slight/No Improvement
Taylor Parents	67	33	71	29	68	32	85	15
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	78	22	75	25	86	14	79	21
Washington Students	79	21	70	30	74	26	64	36
St. Charles Parents	77	23	84	16	80	20	83	17
St. Charles Students	75	25	95	5	79	21	84	16
	–	–	–	–	–	–	–	–
Average percentage, all parents	74	26	77	23	78	22	82	28
Average percentage, all students	77	23	83	17	77	23	74	26
Community Volunteers	100	0	n/a*	n/a*	n/a*	n/a*	100	0
Science Teachers	89	11	77	23	60	40	83	17
	–	–	–	–	–	–	–	–
Average percentage, all respondents	85	15	79	21	72	28	85	15

Note: The numbers for the corresponding survey questions are as follows:
Community Volunteers, #7, NA, NA, 13
Admin/Teacher/Parent, #7, 9, 8, 11
Student, #6, 8, 7, 10

*No comparable questions on community volunteer survey

Table 5. Effectiveness of SFVSC Subcommittees (Percentage of responses)

	SFVSC Logistics			SFVSC Judging			SFVSC Mentoring		
	Excel/ V Good	Good/ Fair	Poor/ V Poor	Excel/ V Good	Good/ Fair	Poor V Poor	Excel/ V Good	Good/ Fair	Poor/ V Poor
Taylor Parents	35	59	6	39	52	9	38	59	3
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	42	44	14	61	35	4	53	34	13
Washington Students	35	60	5	36	60	4	44	43	13
St. Charles Parents	48	52	0	38	62	0	29	63	8
St. Charles Students	49	51	0	36	59	5	38	59	3
	--	--	--	--	--	--	--	--	--
Average percentage, all parents	42	44	14	46	50	4	40	52	8
Average percentage, all students	42	56	2	36	60	4	41	50	9
Community Volunteers	69	23	8	79	21	0	62	38	0
Science Teachers	45	36	19	55	45	0	44	44	12
	--	--	--	--	--	--	--	--	--
Average percentage, all respondents	50	40	10	54	44	2	47	46	7

Note: The numbers for the corresponding survey questions are as follows:
Community Volunteers, #15
Admin/Teacher/Parent, #13
Student, #12

Table 6. Effectiveness of Sandia Technical Representative (Percentage of Responses)

	Effectiveness in in Forming SFVSC			Effectiveness in Technical Consulting		
	Excel/ V good	Good/ fair	Poor/ V poor	Excel/ V good	Good/ fair	Poor V poor
Taylor Parents	52	45	3	51	46	3
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	62	38	0	69	31	0
Washington Students	35	60	5	48	49	3
St. Charles Parents	64	36	0	65	35	0
St. Charles Students	66	34	0	64	34	2
	--	--	--	--	--	--
Average percentage, all parents	59	40	1	62	37	1
Average percentage, all students	51	47	2	56	42	2
Community Volunteers	82	18	0	83	17	0
Science Teachers	67	33	0	67	22	11
	--	--	--	--	--	--
Average percentage, all respondents	65	34	1	67	29	4

Note: The numbers for the corresponding survey questions are as follows:
Community Volunteers, #18, 19
Admin/Teacher/Parent, #16, 17
Student, #15, 16

Table 2 contains the results of the major questions about the philosophy regarding the science fair. As can be seen, a large majority clearly views the science fair as a fun and enjoyable experience rather than a competitive event. There are some small, and probably insignificant, differences among schools. The collective view toward the mentoring is also clearly biased toward the group mentoring approach that was promoted by the Self-Help Program. For example, at St. Charles, 100% of the parents and 85% of

the students favored group mentoring. Also, 80% of Taylor's parents favored group mentoring. Both St. Charles and Taylor used group mentoring programs. In contrast, only 78% of Washington's parents and 58% of the students favored this approach. This may reflect the fact that a more individualized mentoring program was developed at Washington.

The results of the measures of science fair values are presented in Table 3. In general, parental and community involvement in school science fairs is valued by a majority of all four major groups. However, again there is significant variation among schools, especially between St. Charles and Washington. Some of this difference may be related to the parochial school culture, which has traditionally valued and encouraged parental involvement. Most noteworthy is the percentage of teachers -- nearly one third-- who apparently felt that parent/community involvement is of marginal or no value. An overwhelming majority of all the respondents felt that the Self-Help Program is appropriate for other schools and other grades.

Table 4 contains the measures of the perceived effectiveness of the Self-Help Program. A large majority of the respondents, especially the teachers and community volunteers, agreed that the science fair process at their schools needed improvement prior to the implementation of the Self-Help Program. About the same majority believed that the SFVSC, which was created as part of the Self-Help Program, was instrumental in improving the process. Significant majorities of all the constituents also believed that the Self-Help Program assisted in applying parent and community resources as well as in helping to form the SFVSC.

Measures of the effectiveness of the SFVSC are found in Table 5. Respondents were asked to judge each of the three principal subcommittees separately. The results show that a large majority of the involved parties believed the subcommittee performance was fair or better. Roughly half felt that the performance of all of the committees was good or excellent.

The measure of my effectiveness as a technical and organizational consultant is presented in Table 6. As can be seen, a substantial majority of all of the respondents believed that my performance was fair or better and around 65% felt it was good to excellent.

The comments taken from the surveys were also analyzed. A summary of the comments for each of the four constituent groups (students, parents, teachers, and community volunteers) is found in Appendix G. As can be seen, there is little diversity among the comments. However, it is clear that additional publicity is needed for the program.

The results of the survey indicate that the Self-Help Program was successful in helping each pilot school to create an effective support committee for its science fair. The committees' value was recognized by all of the constituents. Sandia's role in the program was also recognized and valued by the various parties. Finally, the

philosophical questions helped provide an insight about how parents, student, teachers, and community volunteers view the science fair. The survey also provided supporting information for the group mentoring approach that is promoted in the program but suggested that some variation in this approach may be needed to meet the needs of different school communities.

Although the survey encourages and strongly supports the basic concepts of the Self-Help Program, enthusiasm should be tempered because a certain portion of the positive response may be due to the Hawthorne effect, which is the tendency of subjects to act differently because they are part of a research group (Campbell and Stanley, 1966). In this case, the subjects of our survey (i.e., the four constituent groups) may tend to respond more favorably than is warranted because they know that the results of the survey are to be published. It is impossible to know at this time how much, if any, of the Hawthorne effect is influencing the responses. But it does suggest that additional surveying, perhaps within the next year or two, may be warranted.

Analysis of Pilot School Performance at the Regional Science Fair Level

In addition to the surveys, another measure of the improvement in each school's science fair process is the performance of the students at the regional science fair. That is, the scores of the students from each pilot school can be compared with students from the same school in previous years. Specifically, a mean score can be computed for each of the three schools for this year and compared with the mean scores from the previous year. A significant increase in the mean scores may reflect an improved science fair process within the schools.

Although this comparison could be enlightening, I had serious misgivings about the analysis for several reasons. First, the objective of the Self-Help Program was to help develop human and social capital within the science fair process. Although an improved school science fair process may lead to improved student performance at the regional science fair, this was not a stated or implied objective of the program. Second, since the Self-Help Program focused on the school's science fair process, the benefits in terms of student performance at the regional fair may not be immediately noticed. Regional performance improvements may occur over a long period of time and may not be statistically significant in the first year or two of the program. Third, among two of the pilot schools, there were significant increases in the number of students that were sent to the regional science fair this year. The purpose of increasing the number of student participants was to allow more students to enjoy the excitement and experience of the regional fair, even if their project was not a potential regional winner. This activity is consistent with the results of the survey, which indicated that most of the school community view the fair as a fun, learning event rather than a competitive one. But I was concerned that the increased numbers of students sent to the regional science fair level might cause a bias in the comparison to previous years, which could lead to misleading results.

Nevertheless, for thoroughness in the analysis, I decided to perform a cursory comparison of the mean scores for the students from each of the pilot schools for 1991 and 1992. Before beginning the analysis, I visually inspected all of the raw scores for the students at each pilot school to determine whether any significant bias existed and to assess the level of normality in the sample. No bias was apparent and all of the samples were reasonably normally distributed, which would allow the application of standard parametric tests for statistical significance.

For all three schools, the differences in the means between 1991 and 1992 were less than 10%. I applied a standard parametric t test to assess the statistical significance of the differences in the means (Gravetter and Wallnau, 1988). All three of the computed t values ranged around 0.7, which is well inside the critical regions for a 5%, two-tailed test (critical t values are around 2.0, and -2.0). Thus, the null hypothesis, which states that there is a no difference between each school's mean scores for this year and last year, cannot be rejected. Essentially, there is no statistically significant difference between the mean regional science fair scores for each pilot school in 1991 and 1992. Therefore, any relationship between the performance of the students at the regional science fair and the Self-Help Program is inconclusive at this time.

7. Conclusions and Recommendations

Based on the experiences at each of the three pilot schools and the results of the survey, I have drawn the following conclusions about the Self-Help Program:

1. The goals of the program were met. As outlined in Section 3 of this report, the most important goal was to help the schools to develop social and human capital within the science fair program by creating a team of teachers, parents, and community volunteers to assist and manage all aspects of the fair. This goal was accomplished at each school through the Science Fair Volunteer Action Committees (SFVSC). The results of the survey show that the committee's efforts were recognized and appreciated.

   A secondary goal was for me, the Sandia Science Fair Facilitator, to effectively provide technical and organizational materials to the schools along with guidance about how to develop the SFVSCs and operate them. Again, the results of the survey indicate that I was successful in accomplishing this goal.

2. An important feature of the Self-Help Program was its flexibility, which allowed each school to tailor its program to meet its specific community needs. As can be seen in the accounts of the activities at each pilot school (Section 5), the program in each community was specifically designed to meet the community's needs. For example, Washington Middle School held their school science fair at an unusually early date to allow more time to implement a well-organized mentoring program, which would assist those students whose projects were to compete in the regional fair. Taylor Middle School decided to use a series of workshops to assist the science fair students throughout the process. They also placed a great deal of emphasis on developing and documenting the judging procedure for their school's science fair. St. Charles provided a single, but well developed workshop, coupled with a mentoring hotline, to provide assistance to the science fair students.

3. The Self-Help Program was successful in each pilot school. The observations about the programs from the participants at Washington and Taylor Middle Schools indicate that these programs were very successful. Observations at St. Charles, however, suggest that the program was also successful, but with some organizational and political problems.

   The survey results show that the Self-Help Program was visible and productive at each of the schools. It should be noted that the survey results at St. Charles are about as positive as those for the other pilot schools. This suggests that the observed organizational and political problems within the SFVSC did not seriously impact the committee's performance in supporting the school's science fair.

4. One of the purposes of the Self-Help Program is to promote the development of a sustainable science fair support activity within the schools. I theorized that once a SFVSC could be established within a school community, its benefits would be highly valued and its continued existence would be insured. It is too early to conclude that this is happening at each of the pilot schools. However, the early indications are very positive. Each of the three pilot schools has plans to expand and enhance its SFVSC in the upcoming years. At present, each school's SFVSC is assessing its successes and problems, developing solutions, and planning next year's activities. This procedure is particularly apparent at Washington where they are surveying the participants of the mentoring program to help identify areas of improvement. A copy of the survey is found in Appendix C.

5. The support from the administration, teachers, parents, and community was excellent in each school. All four of these elements were present in the SFVSC at each pilot school. The responsiveness and enthusiasm of the Kiwanis Club volunteers were especially noteworthy. Kiwanis volunteers participated in nearly all of the activities, which ranged from providing organizational assistance to the SFVSCs to individual student mentoring.

6. The surveys reveal some important information about the philosophy and disposition of the four constituents (parents, students, teachers, and community volunteers) regarding the science fair. For example, all of the constituents appear to value the efforts of volunteers in the school, particularly in support of the science fair. However, there is some important variation in the responses. Community volunteers are very positive, while teachers are somewhat more ambivalent. However, there is no apparent ambivalence about the value and applicability of the self-help concept, which nearly all constituents believe is applicable for other grades and other schools.

   There also seems to be agreement among the constituents that the primary intention of the science fair is to enhance learning while providing some fun for the students. It is also clear that group mentoring programs are preferred over those offering individual mentoring. However, again there are important variations, particularly among schools. For example, a very significant percentage of the Washington Middle School parents and students felt the individual mentoring was the preferred method.

   The survey results dealing with philosophy do seem to support the basic approaches that are promoted by the Self-Help Program. However, the sample is limited to three schools and may not reflect the population of schools. Moreover, the variation in responses among schools, especially regarding the approach to mentoring, suggest that no firm conclusions can be drawn at this time. Conversely, they do not suggest that the Self-Help Program is, in any significant way, misdirected.

7. The results of the pilot program are not consistent with Convey's suggestion that parental involvement works best in private and parochial schools (Convey, 1987). In this study, all three schools successfully applied parental and community resources. The most impressive application of parental and community involvement was at Taylor, a public middle school. At the same time, St. Charles, a parochial school, experienced some difficulties. However, the results of this study are based on a very small sample of schools, which may not represent the population of schools. It is inappropriate to use these findings to infer that Convey's suggestions, which are more broadly based, are incorrect.

Based on these conclusions, I submit the following recommendations:

1. The Self-Help Program should continue to be refined and tested in other pilot schools. Since the Self-Help Program is eventually intended for all grade levels, at least one elementary and one high school should be included in the next phase of testing.

   The next phase of testing should focus on the use of the documented experiences from the three pilot schools during the 1991-1992 school year. Specifically, the experiences from the three pilot schools should be consolidated into a "How-To" manual for use by other schools who want to develop their own science fair Self-Help Program. The how-to manual should contain details about how to identify parent and community resources, and how to organize them into an effective SFVSC. Suggestions and materials should also be provided about the activities of the SFVSC, including the organization of the various workshops, judging organization and implementation, and student mentoring programs. The how-to manual should be provided to each of the new pilot schools as the basis for developing its programs. The objective of this pilot testing is to assess the effectiveness of these documents in providing the necessary information for the schools to develop their own SFVSC.

2. The progress of the three pilot schools should continue to be monitored for several years to more completely assess the effectiveness of this year's efforts. The monitoring may consist of an annual survey or interviews with selected representatives of each school.

3. The Kiwanis Club volunteers, and others like them, should be developed into a source of human and social capital for school communities, especially for science fairs. I believe that specific programs should be developed to systematically identify potential civic and volunteer organizations in the community who can help with school science fairs. Once identified, these volunteers should be trained to provide consistent and high-quality support to schools.

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Appendix A:
Presentation Materials for Initial Meeting

SCIENCE AND ENGINEERING FAIR SELF-HELP DEVELOPMENT PROGRAM

FOR ELEMENTARY, MIDDLE, HIGH SCHOOLS

David Menicucci

Sandia National Laboratories

OUTLINE OF TODAY'S TALK

* Educational Philosophy of parent involvement in schools
* Describe the Science Fair Self-Help program
* Discuss how to apply the program
* Question & answer; discussion

PARENT/COMMUNITY INVOLVEMENT WORKS

Parental and Community involvement in schools has been proven to be effective in improving educational quality

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WHAT IS IMPEDING PARENTAL INVOLVEMENT IN SCHOOLS

1. **ECONOMICS: Two-parent working families make parent-school interaction difficult.**

2. **INSTITUTIONAL: Schools have tended not to encourage parental involvement in education through fear of liability, improper management of volunteers, etc).**

3. **SOCIETAL: Many people today seek a single-point solution for problems. Schools are easy targets.**

WHAT IS IMPEDING COMMUNITY INVOLVEMENT IN SCHOOLS

1) Schools overlooked the potential of this resource.

2) Community sees no avenue to become involved.

THIS SITUATION IS NOT NATURAL FOR PARENTS

Parents will assume educational responsibility and involve themselves in the educational process

IF

they are properly motivated and encouraged

THIS SITUATION IS NOT NATURAL FOR COMMUNITY VOLUNTEERS

1) Community volunteers have always supported education

2) Many civic groups are dedicated to serve education (Kiwanis, Lions, Civitans).

3) Retirees are especially motivated to assist in schools.

4) Community volunteers represent a huge pool of talent.

MOTIVATIONAL FACTORS FOR COMMUNITY - PARENT/SCHOOL INTERACTION

* Volunteers' efforts must be meaningful

* Volunteers' efforts must directly relate to the children's education (collectively or individually)

* Volunteers' efforts must be appreciated

SANDIA'S SCIENCE FAIR SELF-HELP PROGRAM WAS DESIGNED TO BUILD PERMANENT SOLUTIONS TO PROBLEMS

* Need for improved school science fair process is clear:
  - Teachers overworked/discouraged
  - Resources appear scarce
  - Parents and community not meaningfully involved
  - SF students not properly guided

* Shares the development risks with the school community:
  - Program is driven by the school community
  - Requires parent, teacher, community volunteers
  - Sandia supplies some supporting materials and documents

* The program focus is on developing a permanent Science Fair Support Program in the school
  - It helps develop a support commitee based on internal resources.
  - It promotes continued growth of the support process.
  - It builds community spirit and enthusiasm.

SELF-HELP PROGRAM OBJECTIVE

TO PERMANENTLY IMPROVE THE QUALITY OF THE SCIENCE AND ENGINEERING FAIR EXPERIENCE FOR STUDENTS, PARENTS, AND TEACHERS

THE SELF-HELP PROGRAM:

- Was conceptualized at Sandia (D. Menicucci)
- Funded through Sandia's Educ. Outreach Program
- Is affiliated with the Northwest New Mexico Regional Science and Engineering Fair
- Was implemented on a trial basis at Washington Mid School, St. Charles, and Taylor Mid School (Results published in SAND92-1442)
- How-to manual describes some ideas on how to develop the self-help program in schools.

PROGRAM ADVANTAGES

Teacher:	Less organizational work; more time to teach science; more successful students
Parents:	Better science education; students directed into productive and rewarding activity
Student:	More competitive projects; improved learning; more rewards and fun
Adminis:	Improved science education program; happy students, teachers, parents; recognition for school
Sandia:	Accomplishes the DOE educational outreach mission

HOW DOES IT WORK?

1. Identify school science fair tasks/schedule
2. Sandia Self-Help "How To" Manual helps organize school community and volunteers (Science Fair Volunteer Support Committee (SFVSC))
3. Sandia Self-Help "How To" Manual helps train SFVSC on judging, mentoring
4. SFVSC assigns resources to the tasks
5. SFVSC performs tasks
6. SFVSC celebrates the successes

TEACHER/ADMIN. ROLE IN THE PROGRAM

* Commit to excellence in science education as well as the science and engineering fair
* Provide direction and guidance to the SFVSC; identify needs to the support group!
* Provide internal educational materials and guidance

PARENTS' ROLE IN THE PROGRAM

* Identify and involve interested parents to form a SFVSC (everyone can help regardless of background!)
* Organize SFVSC efforts through the H&S/PTO; Provide all of the support to run the fair
* Assist in judging and mentoring as needed (primarily parents with technical backgrounds)

COMMUNITY VOLUNTEER'S ROLE IN THE PROGRAM

* Help organize the SFVSC
* Provide resources to the school
* Assist in judging and mentoring as needed.

SANDIA'S ROLE IN THE PROGRAM

* Provide published materials on program organization
* Provide professional science/engineering consulting

THE THREE MAJOR ELEMENTS OF THE SCIENCE FAIR VOLUNTEER SUPPORT COMMITTEE

* LOGISTICS: Organize the science fair (gym, forms, prizes)
* JUDGING: Organize the judging effort (define procedure, identify/qualify judges, invitation and thank-you, etc)
* MENTORING: Organize the student mentoring effort (identify/ qualify professional mentors, match students to mentors, etc.)

SAMPLE SCHEDULE

SCIENCE FAIR ACTIVITIES AND TASKS FOR THE SCIENCE FAIR VOLUNTEER SUPPORT COMMITTEE (SFVSC)

DATE	SCHEDULED ACTIVITY	SFVSC TASKS AND ACTIVITIES
Sept	Students select projects	Sandia's "How-To" manual used to help organize volunteers into a volunteer support committee; assign tasks Sandia's "How-To" manual used to help train SFVSC SFVSC plans school fair: – Logistics – Judging – Student mentoring
Oct	Students begin work	Guide students about science/engineering and science fair (e.g., SFVSC sponsors a student science fair workshop) Organize and contact judges Organize school fair (i.e., reserve gym, move tables, get awards, make judging forms, etc.)
Nov	Students continue work	Provide mentors as required
Jan	Students complete projects	Mentors help students finish; present results
Feb	Students to sch fair	Operate school fair
Mar	School winners go to regional fair	Provide mentors to school winners to prepare for regional
Apr	Regional winners go to state fair	Provide mentors to winners to prepare for state
May		Measure success; rewards volunteers; celebrates

LIST OF IMPORTANT TASKS WITHIN THE SCIENCE FAIR VOLUNTEER SUPPORT COMMITTEE

LOGISTICS SUB-COMMITTEE:

1) Overall SFVSC coordinating
2) Typing letters, completing forms, etc.
3) Arranging/organizing the science fair room (move tables, pick up ribbons, prizes)
4) Making signs and posters that provide directions
5) Arranging for refreshments during fair
6) Running to fetch students during the fair
7) Fund-raising
8) Generally assisting teachers as needed
9) Coordinating volunteers (organize and contact volunteers, insure that all volunteers are recognized and thanked, etc.)

LIST OF IMPORTANT TASKS WITHIN THE SCIENCE FAIR VOLUNTEER SUPPORT COMMITTEE

JUDGING SUB-COMMITTEE:

1) Judging coordinator (judging sub-committee chair)
2) Judge organization (contact and qualify judges, assign judges to projects, develop and maintain list of judges, etc.)
3) Judging organization (develop and document judging procedure, train judges on proper procedures, organize scoring including check-in table, judge score verification, tally sheets, create judging forms, etc.)
4) Assisting in selecting students to proceed to regional (help organize a review committee to review projects and scores, develop a procedure to select representatives, document process)

LIST OF IMPORTANT TASKS WITHIN THE SCIENCE FAIR VOLUNTEER SUPPORT COMMITTEE

MENTORING SUB-COMMITTEE:

1) Mentoring coordinator (Mentoring sub-committee chair)

2) Mentor organization (contact and qualify mentors, develop and maintain list of mentors, etc.)

3) Mentoring organization (develop mentoring procedure, train mentors on proper procedures, assign mentors to student(s), organize group mentoring, document events and progress)

REMEMBER TO MEASURE THIS PROGRAM'S PROGRESS

1. Survey participants (parents, teachers, students)

2. Compare student's science fair performance with previous years.

3. Other ways defined by the SFVSC

Appendix B:
List of Resource Materials
Provided by Sandia that Relate to Science Fairs

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Judging Criteria
(from Northwest New Mexico Regional
Science and Engineering Fair)

JUDGING CRITERIA

WHAT ARE WE JUDGING?

We are judging the following:

- The quality of the work done on a project in science, engineering or mathematics by a high school student, and how well that student understands the project and the area in which he has been working. Only secondarily are we evaluating the physical display.

- A project which involves laboratory, field, or theoretical work, and not just library research or gadgeteering.

- A high school student's work, and not that of a PhD candidate or a professional. Sometimes judges tend to overreact to high school students, either giving them far more credit than they deserve, or acting as though the work done by the student was worthless because it was not in the Nobel Prize category.

- A project as compared with the other projects in the same category, and not with projects seen elsewhere under other circumstances.

CRITERIA

Exhibits are judged on the following basis:

Creative ability	30 points
Scientific thought/Engineering goals	30 points
Thoroughness	15 points
Skill	15 points
Clarity	10 points

Creative Ability (30 points)

1. Does the project show creative ability and originality in
   - the question asked?
   - the approach to solving the problem?
   - the analysis of the data?
   - the interpretation of the data?
   - the use of equipment?
   - the construction or design of new equipment?

Obviously, no project would be creative and original in all these aspects, and in addition, one must keep in mind that one is dealing with high school students. Thus, one must ask whether something is creative and original in terms of a professional level, or for a high school student. The latter is most probable, and means that it is very important to try to ascertain the nature of the assistance that the student has received.

A student should not be penalized for taking help from others (all professionals receive help to some degree in some way). But credit for creative ability and originality should be in regard to what the student himself has contributed, and not for what others have done for him.

For example, did a student get an idea for his project from a textbook suggestion for research, or did he develop the idea himself as a result of reading or work that he had done? If he developed the idea himself, it would be considered more creative.

A warning to judges should be made at this point. There have been projects which had elements in them which judges thought were original, but which actually came out of textbooks or laboratory manuals in newly developed curricula with which they were unfamiliar. This possibility should be kept in mind.

Another source of help which should be evaluated is that received from a teacher or other adult. A student may have a very original approach for solving a problem, but it may have come out of suggestions made by a scientist or engineer with whom he worked during the summer. This idea must be compared with something less sophisticated, but which came genuinely from the work or thinking of a student. The latter would be considered more creative.

2. Collections cannot be considered to be creative unless they are used to support an investigation and help to answer a question in some original way. Construction of equipment which involves the assembly of a kit cannot be considered to be creative unless some unusual approach or design is used.

3. For engineering, a clear distinction should be made between gadgeteering and a genuine contribution. A "Rube Goldberg" device may be ingenious, but if it is not really the most efficient way to solve a problem, if it is not acceptable to the potential user, if it is unreliable in its functioning, then it cannot really be considered to be a valuable creative contribution.

Scientific Thought/Engineering Goals (30 points)

Scientific Thought:

1. Is the problem stated clearly and unambiguously?

2. Is the problem sufficiently limited so that it was possible to attack it? One of the characteristics of good scientists has been reported to be the ability to identify important problems that are capable of solution. Simply working on a difficult problem without getting anywhere does not make much of a contribution. On the other hand, neither does solving a very simple problem.

3. Was there a procedural plan for obtaining a solution?

4. Are the variables clearly recognized and defined?

5. If controls were necessary, was there a recognition of their need, and were they correctly used?

6. Are there adequate data to support the conclusions?

7. Are the limitations of the data recognized?

8. Does the student understand how his project ties in with related research?

9. Does the student have an idea of what further research is indicated?

10. Did the student cite scientific literature, or did he cite only popular literature (local newspaper, Reader's Digest, etc.)?

Note: It should be pointed out again that the student may have received assistance, and that it is important to estimate the extent of this assistance, and what contribution it made to the project.

Engineering Goals:

Note: We have not had much experience in applying these criteria to student projects, and so judges are urged to use them as guidelines only. Remember, we are judging among the exhibits in the ISEF, and not against engineering projects done by professional engineers.

1. Does the project have a clear objective?

2. Does this objective have relevance to the needs of the potential user?

3. Is the solution

- workable? Unworkable solutions may be interesting but are of no value from a practical point of view.

- acceptable to the potential user? Solutions which will be rejected or ignored are of no value.

- economically feasible? A solution which is so expensive that it cannot be utilized is of no value.

4. Can the solution be successfully utilized in design or construction of some end product?

5. Does the solution represent a significant improvement over previous alternatives?

6. Has the solution been tested to see if it will perform under the conditions of use? (This may be difficult for many students, but it should at least be considered.)

Thoroughness (15 points)

1. Does the project carry out its purposes to completion within the scope of the original aims?

2. How completely has the problem been covered in the project?

3. Are the conclusions based on a single experiment, or on replication?

4. If it is the kind of project where notes were appropriate how complete are they?

5. Is the student aware of other approaches or theories concerning his project?

6. How much time was spent on the project?

7. Is the student familiar with the scientific literature in the field in which he was working? Note: Citations are not considered to be an important consideration in engineering (as opposed to science) and so a student should not be penalized for a lack of citations.

Skill (15 points)

1. Does the student himself have the skills required to do all the work necessary to obtain the data which support his project? Laboratory skills? Computation skills? Observational skills? Design skills?

2. Where was the project done? Home? School laboratory? University laboratory? What assistance was received from parents, teachers, scientists, or engineers?

3. Was the project carried out under the supervision of an adult, or did the student work largely on his own?

4. Where did the equipment come from? Did the student build it himself? Was it obtained on loan? Was it part of a laboratory in which he worked?

Clarity (10 points)

1. How clearly is the student able to discuss the project? Is he able to explain its purpose, procedure and conclusions in a clear and concise manner? Discount a glib tongue but try to make allowances for nervousness which may result from talking to an authority. Try to watch out for memorized speeches with little understanding of principles.

2. Has the student expressed himself well in written material? Remember that such material could have been prepared with the assistance of another person.

3. Are the important phases of the project presented in an orderly manner?

4. How clearly are the data presented?

5. How clearly are the results presented?

6. How well does the project display explain itself?

7. Is the presentation done in a forthright manner, without cute tricks or gadgets?

8. Was all work done by the student, or did he receive assistance from his art class or others?

Choosing Project Categories
(from Northwest New Mexico Regional
Science and Engineering Fair)

CHOOSE THE CORRECT CATEGORY

Every year a few exhibits are placed in the wrong category. The error usually arises because the student confuses the basic idea behind the project with some of the methods or equipment used to carry out the work. For example, many projects will involve the use of a computer, but only a few will qualify for the Computer Science category. The Earth and Space category involves geology and astronomy. Solar collecting systems belong in the Environmental Science or Engineering category. Please give your students a chance to compete fairly. Double check their categories.

BEHAVIORAL AND SOCIAL SCIENCES. Psychology, sociology, anthropology, archaeology, ethology, ethnology, linguistics, animal behavior (learned or instinctive), learning, perception, urban problems, reading problems, public opinion surveys, educational testing,

BIOCHEMISTRY. Molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones, etc. *SEE FOOTNOTE BELOW

BOTANY. Agriculture, agronomy, horticulture, forestry, plant taxonomy, plant physiology, plant pathology, plant genetics, hydroponics, algae, etc.

CHEMISTRY. Physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, fuels, pesticides, metallurgy, soil chemistry, etc.

COMPUTER SCIENCE. New developments in software or hardware, information systems, computer systems organization, computer methodologies, and data (including structures, encryption, coding and information theory), etc.

EARTH AND SPACE SCIENCES. Geology, geophysics, physical oceanography, meteorology, atmospheric physics, seismology, petroleum, geography, speology, mineralogy, topography, optical astronomy, radio astronomy, astrophysics, etc.

ENGINEERING. Civil, mechanical, aeronautical, chemical electrical, photographic, sound, automotive, marine, hearing and refrigerating, transportation, environmental engineering, etc. Power transmission and generation, electronics, communications, architecture, bioengineering, lasers, computers, instrumentation, etc.

ENVIRONMENTAL SCIENCES. Pollution sources and their control, waste disposal, impact studies, environmental alteration (heat, light, irrigation, erosion, etc.), ecology.

MATHEMATICS. Calculus, geometry, abstracts algebra, number theory, statistics, complex analysis, probability, topology, logic, operations research, and other topics in pure and applied mathematics.

MEDICINE AND HEALTH. Medicine, dentistry, pharmacology, veterinary medicine, pathology, opthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing, etc.

MICROBIOLOGY. Bacteriology, virology, protozoology, fungi bacterial genetics, yeast, etc.

PHYSICS. Solid state, optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics, etc.

ZOOLOGY. Animal genetics, ornithology, ichthyology, herpetology, enthomology, animal ecology, anatomy, paleontology, cellular physiology, circadian rhythms, animal husbandry, cytology, histology, animal physiology, invertebrate neurophysiology, studies of invertebrates, etc.

*BIOCHEMISTRY is a Senior Division category at the regional fairs and ISEF. Because of the small number of entries in this area in recent years, it is not a category at the State Fair.

CATEGORY INTERPRETATIONS

It is impossible to develop category descriptions which can be applied to any and all projects without some questions. In particular, the increasingly interdisciplinary nature of science and engineering means that many projects will draw upon more than one field. To determine a project category, it may therefore be necessary to identify the primary emphasis.

For example, limnology is defined as the scientific study ot the physical, chemical, meteorological, and biological conditions in fresh water. A project in limnology would thus have to be considered from the point of view of its primary emphasis (physics, chemistry, etc.) to be placed in the appropriate category.

Here is a list of project areas about which questions may arise. This is not a complete list, and is simply given to provide some basis for interpretation of the category descriptions.

Instruments.

The design and construction of a telescope, bubble chamber, laser, or other instrument would be Engineering if the design and construction were the primary purpose of the project. If a telescope were constructed, data gathered using the telescope, and an analysis presented, the project would be placed in Earth and Space Sciences.

Marine Biology. Behavioral and Social Sciences (schooling of fish), Botany (marine algae), or Zoology (sea urchins).

Fossils. Botany (remnants of ferns), Chemistry (chemical composition of fossil shells), Earth and Space Sciences (geological ages), and Zoology (prehistoric animals).

Rockets. Chemistry (rocket fuels), Earth and Space Sciences (use of a rocket as a vehicle for meteorological instruments), Engineering (design of a rocket), or Physics (computing rocket trajectories). A project on the effects of rocket acceleration on mice would go in Medicine and Health.

Genetics. Biochemistry (studies of DNA), Botany (hybrid corn), Microbiology (genetic studies of bacteria), or Zoology (fruit flies).

Vitamins. Biochemistry (how the body deals with vitamin C), Chemistry (analysis), and Medicine and Health (effects of vitamin deficiencies).

Ecology - Environment - Pollution. In a study of the eutrophication of Lake Erie: Behavioral and Social Sciences (the human beings who cause the problem), Chemistry (the process of eutrophication), Botany (growth of algae), Engineering (water purification micro-organisms), and Zoology (fish population). If the primary emphasis is environment there is an ENVIRONMENTAL SCIENCE category (1982).

Pesticides. Biochemistry (the mechanism of toxic effects), Botany (plant intake and concentration), Chemistrty (composition of pesticides), Earth and Space Sciences (mechanism of runoff), Medicine and Health (effects on human beings and animals).

Crystallography. Chemistry (crystal composition), Mathematics (symmetry), physics (lattice structure), and Earth and Space Sciences (crystal morphology and habit).

Speech and Hearing. Behaviorial and Social Sciences (reading problems), Engineering (hearing aids), Medicine and Health (speech defects), Physics (sound), Zoology (structure of the ear).

Radioactivity. Biochemistry, Botany, Medicine and Health, and Zoology could involve the use of tracers. Earth and Space Sciences or Physics could involve the measurement of radioactivity. Engineering could involve design and construction of detection instruments.

Space-related Projects. Note that many projects involving "space" do not go into Earth and Space Sciences: Botany (effect of zero G on plants), Medicine and Health (effects of G on human beings), Engineering (development of closed environmental system for space capsule).

Outline of the Engineering Method

OUTLINE OF THE ENGINEERING METHOD

Prepared for Science Fair Participants
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Background information about science and engineering

Before the engineering methodology can be fully appreciated, it is important to understand the differences between scientists and engineers. There are two characteristic differences: a) the process of science focuses on research while engineering focuses on design, 2) the end product of science is knowledge about the world, while engineering produces a physical product.

Scientists direct their efforts toward improving mankind's understanding of nature by searching for explanations, classifications, and models to predict natural phenomena. This process of searching is called research, and the techniques employed are referred to as the scientific method. Thus, the end product of the scientist's efforts is knowledge, sometimes without regard to its immediate application in the world.

In contrast, the end product for an engineer is a physical device, design for a device, or process or procedure. The process used in creating these end products is called design, and the techniques employed are called the engineering method. Some of the engineer's concerns in applying this method include economic feasibility, safety, manufacturability, public reactions to the design, and effectiveness of the device or process in solving a problem.

The Engineering Method:

There are five basic steps in the engineering method. These include 1) problem definition and engineering goal 2) approach, 3) analysis, 4) evaluation, and 5) presentation of results.

Each of these steps is outlined below:

<u>Problem definition and engineering goal</u>: The basic objective of this step is to clearly identify and describe the engineering problem. Details are provided to show that the problem is real and that a solution is needed. The limitations of the problem and the solution are outlined, and some suggestions may be put forth as to what may be acceptable solutions. The final outcome of this step is a problem statement. The engineering goal follows directly from the problem definition and is stated clearly in this section.

Approach: In this step the engineer documents the plan for achieving the engineering goal. This begins with a literature review about the problem and a discussion of the findings. This will include a presentation of previous work to solve the problem including an explanation of why these efforts failed and how much of the information can be applied to the problem. Related information will also be discussed including new technological developments or scientific innovations that may now be applied to solving the problem. This is followed by a discussion of the additional information needed to solve the problem and how this information will be obtained. The level of accuracy of experimental data is also described. Any simplifying assumptions should also be listed, especially those made to substitute for missing information.

The steps that will be used to solve the problem are then outlined in as much detail as possible. Usually the effort is separated into smaller sub-efforts, each of which has a specific objective and interrelates with the other sub-efforts to accomplish the goal. Each is described in sufficient detail to allow the plan to be easily understood by a reviewer. In general, the initial steps in the process can be seen more clearly than those that occur later, and this is reflected in the level of detail in the descriptions. In some cases, the course of the effort will rest on the decisions that will be made at a later time. In these cases, the plan centers on how the decisions will be made. The plan usually concludes with a timetable that shows the expected level of effort on each of the sub-efforts and includes expected expenditures. The purpose of this is to insure that the goal can be achieved in the required time-frame and within an acceptable budget.

Analysis: The basic objective of this step is to begin executing the plan outlined in the approach. Analysis comprises three components, including data and information gathering, design, and checking results.

Data and information gathering is the process of accumulating all of the necessary information needed to solve the engineering problem. This often includes testing and measurements of components, or systems in order to understand their operational limitations and constraints. Other information may include the advice of experts, copies of mathematical or physical models, and related literature or other documents. At this stage the engineer begins testing and measuring the effectiveness of the basic concepts of the object or process that is the goal of the effort. This testing can be done with physical, mathematical, or computer models. Testing and measuring continue until enough data exists to begin drawing conclusions about the details of the engineering solution.

At this point the engineering design begins. Design involves considering all of the data gathered to this point and using them

to construct specific engineering solutions. These solutions may be a physical device, a design for a product, or a description of a process, all of which are often referred to as the design product. Even though a number of design products may be conceptualized at this time, none is rejected. The selection of the final design will occur in the evaluation step.

The purpose of checking results is to insure that no fundamental errors were made in the process of gathering information or formulating the design product. The objective is to assure that all of the information used in the developing the candidate engineering solutions is accurate and that the logic used in the design is sound.

Evaluation: In the evaluation step the engineer considers the merits of each of the proposed design products with respect to the engineering goal. The design that most effectively meets the goal is selected. In most cases, cost effectiveness is a primary concern. However, performance and/or schedule may be alternative considerations. Where cost effectiveness is the primary concern, the engineer considers the one-time costs of construction, the recurring costs of maintenance, and the effectiveness of the design to solve the engineering problem. Often the least expensive design is rejected because it is less effective in solving the engineering problem than a more expensive design. Frequently, the engineer develops various measures of merit to apply in weighing the alternatives. This helps eliminate human emotion from biasing the decision. In some cases a prototype device is built to demonstrate the viability of the design. As a final step in the process, the selected design should be compared with the original design goal to insure that it meets the main objectives.

Presentation of results: This is the final step in the process; here the engineer presents the final design product. This presentation should clearly document the entire engineering process and should contain all of the details about the final design. It is common that this be done in a final report. However, often the presentation is made verbally to the interested parties. Any recommendations for further work are also documented at this time. These recommendations frequently center on refinements that could be applied to the final design.

EXAMPLE OF HOW TO APPLY THE ENGINEERING METHOD

Problem definition and engineering goal: Suppose the problem is "Steel bridges located in marine environments have high corrosion rates that adversely affect maintenance costs and safety." An associated engineering goal might be "to identify an inexpensive metal coating for use in retarding corrosion of bridge materials in marine environments."

Approach: The basic approach to this problem is be to identify various types of metal coatings, test them on steel in humid environments, and select the best coating to be applied to bridges.

Analysis: This step begins with a library literature search about metal coating materials and any other type of coating materials that can be applied to steel. Based on the results of the search, some sample material will be acquired for testing. The testing may involve the application of the sample coatings to steel and subjecting the steel to a humid, salty environment (this may be simulated with salt water). The results will be noted. After all of the materials have been tested, all of the test results will be carefully checked to insure accuracy. Often this will involve another person to review the analysis.

Evaluation: In this step, the test results are reviewed and the best performing materials are selected for further evaluation regarding the cost of the materials, their market availability, durability, ease of application, and maintenance. In this case, the goal is for the most cost-effective solution. So the coating that gives the best protection for the lowest installation and maintenance costs is selected. To insure that this coating is an appropriate choice, further analysis may be needed. The engineer returns to the analysis step and applies the selected coating to a real (or model) bridge. The results are then evaluated and a final conclusion is drawn.

Presentation of results: The final results are presented in a report that documents, in detail, each of the steps the engineer used in the process of selecting a coating. A poster or oral presentation will contain highlights of the process along with the final conclusion, but will contain much less detail than the report.

REFERENCES

Beakley, G., and Leach, H., Engineering, The MacMillan Co., NY, NY, 1970.

Buhl, H., Creative Engineering Design, Iowa State University Press, Ames, Iowa, 1960.

Fish, J., The Engineering Method, Stanford University Press, Stanford, CA, 1950.

Krick, E., An Introduction to Engineering and Engineering Design, John Wiley & Sons, Inc., NY, NY, 1969.

Sample of Project Rules, Safety Rules, and Definitions (Protocol)

Science and Engineering Fair projects must follow strict rules and regulations, especially if the experiment involves dangerous substances (e.g., pathogens) or live animals. These regulations are sometimes referred to as protocol requirements. Guidance regarding these rules is outlined by the Science Service, the organization that runs the Internaional Science and Engineering Fair. The following section contains a sample of the written rules and regulations provided by the Science Service. The complete set of rules and regulations can be found in "Selections from Rules of the 43rd International Science and Engineering Fair and All ISEF Affiliated and Local Feeder Fairs."

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1719 N Street, N.W., Washington, DC 20036, 202/785-2255)

DISPLAY AND SAFETY

This Display and Safety section pertains specifically to the ISEF. Affiliated fairs are encouraged to follow these guidelines at their fairs, but it is not required.

1. Categories

Categories established for grouping and judging science research projects at the ISEF are:

(1) Behavioral and Social Sciences
(2) Biochemistry
(3) Botany
(4) Chemistry
(5) Computer Science
(6) Earth and Space Sciences
(7) Engineering
(8) Environmental Sciences
(9) Mathematics
(10) Medicine and Health
(11) Microbiology
(12) Physics
(13) Zoology

2. Size

Exhibit size is limited to 76 cm (30 in.) deep, front to back; 122 cm (48 in.) wide, side to side; and 274 cm (108 in.) high, floor to top. (Tables are 76 cm high.) Any exhibit exceeding these dimensions will be disqualified at the ISEF.

3. Animal Displays (Vertebrate or Invertebrate)

a. No live animals, preserved vertebrate/invertebrate animals, taxidermy specimens or parts, including embryos, may be exhibited. Research involving the use of animals may display drawings, charts or graphs to illustrate the conditions, developments, and results of the investigations. Sealed insect collections will be permitted on display.

b. Photographs and other visual presentations of surgical techniques, dissection, necropsies and/or other laboratory techniques depicting vertebrate animals in other than normal conditions may not be displayed on the student's exhibit, but may be contained in an accompanying notebook to be shown only during judging. Photographs of special needs human subjects require signed consent, as per federal regulations.

4. Human Tissue

The exhibition of human parts is prohibited except: teeth, hair, nails, histological sections and liquid tissue slides properly acquired.

5. Power

Normally, 110-volt AC, single phase service with 500 watts per exhibit will be available. Higher amperage and 220-volt service is also available. Students must specify their power requirements in each case. Requests for large amounts of power will be at the exhibitor's expense. (Overhead lighting of the exhibit hall at the ISEF is excellent and, except for any highlighting that the Finalist may desire, general illumination is unnecessary.)

6. Extension Cords

Students are required to furnish their own nine-foot electrical extension cords as necessary to reach floor-located power connections.

7. Assembly

Each student must assemble his or her own exhibit. Help will be limited to unpacking or packing or to situations where the physical size or weight is such that assistance is required. Other assistance is prohibited.

8. Lasers

a. Only Class I and Class II lasers may be displayed and operated at the ISEF. If a Class II laser is operated, it must be done under the following restrictions:

1. The student must be present at all times the Class II laser is operating.

2. A sign must be displayed reading as follows:

"LASER RADIATION - DO NOT STARE INTO BEAM"

3. The Class II laser must have a protective housing or barricade which, when in place, prevents human access to the beam during operation.

4. The power source to the Class II laser must be disconnected when the laser is not being operated.

b. Class III and Class IV lasers may be displayed but not operated at any time and may have no means of electrical connection.

For information about laser standards and research, write to the Food and Drug Administration, Office of Compliance and Surveillance, 1390 Piccard Drive, Rockville, MD 20850 (telephone 301/427-1172).

9. General Rules for Display and Safety

The Display and Safety Committee will review the need for the student to have any of the items listed below that are required to demonstrate the experimental concepts of the student's project during the judging interview only.

a. Anything which could be hazardous to the public is prohibited from display. The intent of this rule is to protect the public and other students and not to hinder the students' ability to present their projects to the judges. The prohibited items include:

1. All live materials including plants and microbes
2. All soil and waste samples and materials
3. All chemicals including containers filled with water for display. Empty chemical containers and nonfunctional apparatus are also discouraged.
4. Food, either human or animal
5. Syringes, pipettes and similar devices
6. Any flames, open or concealed
7. Highly flammable display materials
8. Tanks which have contained combustible gases, including butane and propane, unless they have been purged with carbon dioxide
9. Operation of a Class III or IV laser

Note: Students are encouraged to use photographs, drawings and diagrams to illustrate the research.

b. Proper attention to safety is expected of all fair participants, including compliance with the following requirements for all operating exhibits:

1. Any exhibit producing temperatures exceeding 100°C (212°F) must be adequately insulated from its surroundings.
2. Batteries with open top cells are not permitted. Other types of batteries may be used for electric power.
3. High voltage equipment must be shielded with a grounded metal box or cage to prevent accidental contact.
4. Large vacuum tubes or dangerous ray-generating devices must be properly shielded.
5. High voltage wiring, switches and metal parts must be located out of reach of observers and designed with an adequate overload safety factor.
6. Electric circuits for 110-volt AC must have an Underwriters Laboratories-approved cord of proper load-carrying capacity, which is at least nine feet long.
7. All wiring must be properly insulated. Nails, tacks or uninsulated staples must not be used to fasten wiring.
8. Bare wire and exposed knife switches may be used only on circuits of 12 volts or less; otherwise, standard enclosed switches are required.

9. Electrical connections in 110-volt circuits must be soldered or fixed under approved connectors and connecting wires properly insulated.
10. Safety precautions for substances in the American Chemical Society booklet, "Safety in the High School." For a copy, write to American Chemical Society, Career Publications, 1155 16th Street, N.W., Washington, DC 20036 (telephone 202/872-6168).

c. At the conclusion of judging, the student exhibitor will be responsible for the removal of all chemicals or simulated chemicals, or substances that could be picked up. Specifically, any item that may be damaged by, dangerous to, or removed by the public must be removed.

TEACHER-SUPERVISOR/RESEARCH PLAN/SAFETY REVIEW CERTIFICATION #1

(COMPLETION OF FRONT AND BACK OF FORM IS REQUIRED FOR ALL PROJECTS)

Student's Name (type)_____

Student's School_____

Student's Signature_____

Parent/Guardian's Signature_____

Project Title_____

ISEF Affiliated Fair_____

TEACHER APPROVAL - PRIOR TO RESEARCH

I agree to sponsor the student named above and assume the responsibility for compliance with all existing ISEF Rules and approve the research plan on the reverse side. I have also conducted a safety review as outlined on page 26.

Teacher-Supervisor Name (type)_____

Work Phone _____

Work Address_____

City_____State_____Zipcode_____

Starting date of laboratory or field research_____

Name and address where laboratory or field research will be done

_____

Teacher-Supervisor Signature_____Date_____

Signed for all projects prior to the start of experimental research.

SRC APPROVAL - PRIOR TO RESEARCH (WHEN NECESSARY)*

SRC Review - I certify that the committee has carefully studied this research proposal and certify that all required certifications are included. My signature indicates approval of this research proposal prior to the beginning of experimental work by the student.

Signature_____Date_____
Local Fair SRC Chairperson or Affiliated Fair SRC Chairperson

- **Signature required for all projects involving vertebrate animals, humans, recombinant DNA, tissue or pathogenic agents/controlled substances prior to the start of experimental research.**

Note: Major deviations from the original plan must be approved prior to changes in experimental procedures being used by the student.

SRC APPROVAL - PRIOR TO COMPETITION AT AN ISEF-AFFILIATED FAIR

I certify that this project complies with all ISEF Rules.

Signature_____Date_____
Affiliated Fair SRC Chairperson

Signed for all projects, before competition at the affiliated fair.

This form, with all signatures, must be submitted to the ISEF Scientific Review Committee for students named as ISEF Finalists.

SAFETY REVIEW

REQUIREMENTS AND INFORMATION FOR TEACHER-SUPERVISORS

1. **Chemical Usage** - I have reviewed with the student current safety standards for each chemical to be used in the project and discussed the relevant safety information, including toxicity data, proper handling techniques, and methods for disposal of each chemical.

   NOTE: If a chemical is considered or suspected of being carcinogenic or mutagenic (consult the MSDS Listing for the specific chemical); available only by prescription in the USA; radioactive; explosive; or highly toxic (LD50 of 50 mg/kg or less for oral consumption/LD50 of 200 ppm or less for inhalation of the gas or vapor will vary according to species), prior to the beginning of the research a Research Plan must be completed and approved by the Scientific Review Committee (SRC) (see ISEF Rules, p. 24).

2. **Equipment Usage** - I have reviewed with the student the proper operational procedures and safety precautions for each item of equipment that will be used for the project.

   NOTE: If a project involves high voltage equipment (220 volts or greater); unshielded ionizing radiation of 100-400 nm wavelength; welding; lasers; x-ray or nuclear radiation, prior to the beginning of the research a Research Plan must be completed and approved by the SRC (see ISEF Rules, p. 8).

3. **Experimental Techniques** - I have reviewed with the student the relevant safety precautions associated with the experimental techniques that will be used during the project.

4. **Laboratory or Field Test Animals** - I have reviewed with the student the appropriate procedures required for the safe handling and keeping of any invertebrate or vertebrate laboratory or field animals that will be used in the project. NOTE: All projects involving live vertebrates must be approved by the SRC prior to the beginning of research (see ISEF Rules, pp. 15-18).

5. **Cell Cultures, Microorganisms, or Tissue** - I have reviewed with the student the appropriate safety procedures associated with handling any cell cultures, microorganisms, or vertebrate animal and human tissue to be used in the project. NOTE: These projects must also be approved by the SRC prior to the beginning of research (see ISEF Rules, p. 23).

Example of the List of Project Titles provided to the Pilot Schools

Lists of project titles from the Northwest New Mexico Regional Science and Engineering Fair were provided to the pilot schools for use in their workshops. These lists are included because titles of previous entries can often provide ideas for new projects. The following section contains a sample of the lists which, in total, include over 2300 titles.

List of Project Titles in the 1989 Northwest New Mexico Regional Science Fair

INTELLECTUAL THINKING IN CHILDREN
WHAT ARE THE STRESS LEVELS OF H.H.S. STUDENTS
DOES WHERE STUDENTS ATTEND SCHOOL AFFECT THEIR ATTITUDES TOWARDS COLLEGE SUCCESS
WHY ARE SOME SOUNDS FOUND TO BE DISTURBING?
ASYMMETRY: LATERAL PROPENSITY VS ACTIVITY PREFERENCE
DO DAILY HABITS AFFECT THE WAY YOU DREAM
IS FIGHTING INSTINCTIVE?
FACTORS AFFECTING ANGULAR POSITION ESTIMATION CAPABILITIES
GEOMETRICAL OPTICAL ILLUSION
A COMPARISON OF MALE AND FEMALE TODDLERS VOCABULARY
NITRITES
CAN METHYL SALICYLATE'S OPTICAL & THERMODYNAMIC PROP SHOW SIM IN CHEM STRUC/COMP
CAN PLANTS BE CLONED?
INORGANIC AND ORGANIC SOLVENT INFUSION CAN IT HELP THE CARROT?
COMPARISON BETWEEN THE EFFECTIVENESS OF PLANT GROWTH IN DIFFERENT TYPES OF SOIL
GEOTROPISM IN BEAN PLANTS
EFFECTS OF VITAMINS C AND E ON TOMATOES
QUALITATIVE ANALYSIS OF METAL IMPURITIES IN AQUEOUS SOLUTIONS
FUEL CELLS
GENERATING HOMOGENEOUS SOLUTIONS: ENTROPIC OR REVERSIBLE PROCESS?
DETERGENT EFFECTIVENESS
GROWTH OF SILVER CRYSTALS
ENERGY CONTENT OF COMMON ENGINE FUELS
PHENOLIC PLASTIC
METRIBUZING EXTRACTION FROM SOIL
HOW DOES LIGHTNING MEASURE UP?
SOUTH VALLEY WATER QUALITY
OIL SLICKS: CLEAN UP AND BIOLOGICAL EFFECT
NUCLEAR WASTE TODAY AND TOMORROW
RIO GRANDE COLIFORM CONTAMINATION
HOW CAN A FILTRATION EXPERIMENT IMPROVE OUR METHOD TO DETECT TOXIC METALS IN WATER
HOW ACCURATELY CAN I PREDICT THE STRENGTH OF WOODEN BEAMS
ANALYSIS OF TRUSS SYSTEMS
MICROPROCESSOR-STABILIZED FLIGHT CONTROL SYSTEM
A BINARY ADDER
CAN TIME BE TRANSMITTED BY RADIO WAVES?
ELECTRONIC FEEDBACK POWERED TONE GENERATOR
THE PERFECT BATTERY FOR AN IMPERFECT WORLD
A VOICE FOR THE SPEECH IMPAIRED
NOZZLE EFFICIENCY OF ROCKET AND JET ENGINES
INCREASING THE LIFT CAPABILITY OF A CARGO AIRCRAFT BY IMPROVING WING DESIGN
AERODYNAMICS IN RELATION TO CAR SHAPES
IS A COMPUTERIZED VACUUMING ROBOT POSSIBLE?
IDEAL FIN PLACEMENT FOR AN ARCHERY ARROW TO ATTAIN MAXIMUM SPEED
FIBONACCI NUMBERS
RANDOM POINTS IN TRIANGLE
STATISTICAL ANALYSIS OF HOME FIELD ADVANTAGE IN A 7-GAME WORLD SERIES
HOW LIKELY IS LIFE?
THE GEOMETRIC EVALUATION OF THE SPECIFIC SURFACE OF POWDERS
A NEW CURVE-FITTING METHOD
EMPIRICAL EQUATIONS FOR THE HEAT CONTENT OF CHILE PEPPERS
REALISTIC IMAGE GENERATION USING COMPUTER ALOGORITHMS
CAN YOU DETERMINE WHICH ROOTS ARE MOST LIKELY TO SUCCEED USING NEWTONS METHOD?
GRAPHIC INTERFACE SIMULATION
DYNAMICS OF REMOTE CONTROLLED ROBOTICS
KNOW: A KNOWLEDGE NET AI SYSTEM
LOOK, MA, NO HANDS!
HOW THE EAR WORKS
A COMPARATIVE ANALYSIS OF NORMAL KNEE FUNCTIONS VERSES PROSTHETIC
VASCULAR ENDOTHELIUM: IN VITRO PERMEABILITY AND SURFACE MODULATION
THE EFFECTS OF ULTRASOUND ON BIRTH WEIGHT IN GENERATIONS OF BLACK GERBILS
DOES WEIGHT OR HEIGHT HAVE AN ADVANTAGE IN SWIMMING
ORTHODONTICS AN ANALYSIS OF FORCES

Handouts for
Parent/Student Workshops

DIFFERENCES BETWEEN SCIENCE AND ENGINEERING

1. The process of science focuses on <u>research</u> while engineering focuses on <u>design</u>

2. Science produces <u>knowledge about the world</u> while engineering produces a <u>physical product</u>

THE FIVE-STEP ENGINEERING METHOD

1. **PROBLEM DEFINITION AND ENGINEERING GOAL**
   - **Describe what the problem is and what solution is needed**

2. **APPROACH**
   - **Outline the plan to solve the problem**

3. **ANALYSIS**
   - **Begin plan execution; collect information, design possible solutions, check results**

4. **EVALUATION**
   - **Evaluate possible solutions and choose the best one**

5. **PRESENT RESULTS**
   - **Write a complete description of the final solution**

THE FIVE-STEP SCIENTIFIC METHOD

1. **IDENTIFY A QUESTION TO BE ANSWERED**
   - Describe a curious physical behavior to be explained

2. **HYPOTHESIS**
   - Form a guess to explain the behavior

3. **METHODOLOGY**
   - Develop a plan to test the accuracy of the hypothesis

4. **DATA COLLECTION AND ANALYSIS**
   - Collect data according to the plan; analyze results

5. **DRAW CONCLUSIONS**
   - Based on the data and analysis, draw a conclusion about the accuracy of the hypothesis

EXAMPLES OF SCIENCE PROJECTS

1. **Do flies have a color preference?**

2. **Do lighting levels affect the performance of 8th grade math students?**

3. **What are the effects of nitrates on bacterial reproduction rates? (Why doesn't bacon spoil very fast)**

4. **Can you use random numbers to simulate weather patters in Northern New Mexico?**

5. **Is there a relationship between age of men and the severity of allergy symptoms?**

EXAMPLES OF ENGINEERING PROJECTS

1. **The development of a plastic coating to retard rust on metal bridges in marine environments**

2. **A technique to make paper from weeds**

3. **A method to use nitrates to remove organic pollution from well water**

4. **Design and construction of a mechanical arm**

5. **Testing of clay materials for use as wall insulation**

SAMPLE ENGINEERING PROJECT

1. **PROBLEM DEFINITION AND ENGINEERING GOAL**
   - **Black roofing tar used to seal around pipes on roofs cracks in the hot NM sun. This reduces the life of the roof. A solution is to develop a way to reduce the cracking.**

2. **APPROACH**
   - **Outline the plan to solve the problem**

3. **ANALYSIS**
   - **Begin plan execution; collect information, design possible solutions, check results**

4. **EVALUATION**
   - **Evaluate possible solutions and choose the best one**

5. **PRESENT RESULTS**
   - **Write a complete description of the final solution**

JUDGING CRITERIA

1. **CREATIVE ABILITY (30%)**

2. **SCIENTIFIC THOUGHT/ENGINEER GOALS (30%)**

3. **THOROUGHNESS (15%)**

4. **SKILL (15%)**

5. **CLARITY (10%)**

SCIENTIFIC THOUGHT/ENGINEERING GOALS (30%)

SCIENCE:

1. Is problem state clearly
2. Was the problem limited enough to solve
3. Was the procedure reasonable
4. Are the variables defined
5. Were controls used
6. Was enough data taken
7. Is other research cited

ENGINEERING:

1. Is the objective clear and useful
2. Is the solution workable, acceptable, and economic
3. Is the solution an improvement over existing methods
4. Has the solution been tested

CREATIVE ABILITY (30%)

1. **Is the project creative in**
   -question asked
   -approach to solving the problem
   -analysis of the data
   -interpreting the data
   -use of equipment
   -construction or design of equipment

2. **Collections are not creative**

3. **For engineering, avoid useless gadgets**

THOROUGHNESS (15%)

1. Did the project meet its purpose
2. Has the problem been addressed
3. Are the conclusion based on replication
4. Was a notebook used for observations
5. Were other approaches considered
6. Was enough time spent on the project

SKILL (15%)

1. **Does the project meet the student skill**
2. **What assistance was received**
3. **How much of the work was the student's**
4. **Where did the equipment come from**

CLARITY (10%)

1. How clearly can the student discuss the project
2. How clearly is the project presented
3. Is the project logically presented
4. Are the data clearly presented
5. Are the results clearly presented
6. Is the display clear and free of cute tricks or gadgets

STEPS IN DOING A SCIENCE FAIR PROJECT

1. IDENTIFY THE PROBLEM AND PURPOSE OF PROJECT; STATE A HYPOTHESIS (GUESS) AS TO THE SOLUTION

2. FORM PROCEDURES; ESTABLISH WHAT EXPERIMENTS TO DO; LIST ALL MATERIALS AND HOW USE THEM

3. EXPERIMENT AND COLLECT DATA; OBSERVE AND RECORD IN A NOTEBOOK; USE TABLES AND GRAPHS; USE METRIC SYSTEM

4. STATE THE RESULTS; DISCUSS WHAT HAPPENED DURING EXPERIMENTS AND HOW RESULTS MATCH THE HYPOTHESIS

5. STATE A CONCLUSION

A RESEARCH PAPER CONTAINS:

1. An abstract
2. A title page
3. The purpose of the project
4. Acknowledgement to those who helped
5. Any protocol forms for working with animals, etc.
6. Materials and methods of procedure
7. Results
8. Conclusions
9. Bibliography or list of literature cited.

Appendix C:
Science Fair Resource and Organization Materials Developed by Washington Middle School SFVSC

SFVSC Organizational Notes C-3
Information Regarding Judging C-13
Information and Handouts for the Parent/Student Science Fair Orientation Workshop C-21
Handout Materials for Teacher's In-Service Science Fair Training C-33
Information from the Science Fair Mentoring Program C-35

WASHINGTON MIDDLE SCHOOL

SFVSC Organizational Notes

SFVSC Notes from Science Fair Parent / Student Orientation Workshop

1. Allow Students to be Successful

   a. Provide Guidelines
   b. Provide Examples
   c. Provide Timelines
   d. Provide Feedback

2. Submit Appropriate Protocols Nov. 4
   Jan 10

3. Entry Forms
   Certificate Entry (with Protocol)

4. Encourage graphs, drawings, and photographs

5. Regionals Mid-March

   p. 1-6 Categories and Protocols
   p. 7-10 Display and Safety
   p. 11-22 Science Fair Topics
   p. 23-30 Useful Organizational Handouts

11-18-91

SFVSC Meeting Summary

1. Teachers will PREJUDGE their class projects. These projects will be marked so that the Science Fair Judges can spend more time on these projects.

2. Up to 5 ribbons will be awarded in each category. Each Science Teacher will be given 3 Honorable Mention Ribbons to award at their discretion.

3. Short Award Reception Wednesday evening, December 11.
   a. Time: 6:00 — 7:30
   b. Awards in cafeteria 7:00 — 7:30
      * Awards packets given to Regional Qualifiers
   c. Ask parent center for babysitting services.

4. A CATEGORY LIST will be sent out the first week in December in order to assign numbers to the projects and to premark cards for the TOP projects per class.

5. Duty Roster Reminder
   a. All teachers PREJUDGE their class projects.
   b. Complete category list by Wednesday, December 4.
   c. Greg — Table pick-up and drop-off Monday, December 9.
   d. Cherri — Judge (Help put judge packets together)
   e. Sue — Ribbons
   f. <u>Set Up — Monday, December 9</u>
Edgar, Jackie, Sue, Joe, Bruce,
Cherri, Rhonda

      <u>Clean Up — Thursday, December 12</u>
Pat, Tom, Angie, George,
(Greg — return tables)

INVENTION CATEGORIES

1. Machinery
2. Personal Hygiene
3. Toys
4. Clothing
5. Travel — Recreation
   Transportation
6. Office / School Supplies
7. Solar
8. Music
9. Household Projects
10. Pets
11. Plants
12. Medicine
13. Entertainment
14. Lens
15. Architecture

These are last year's categories for inventions. If you need to add a new category, please let me know — leave a note in my box (Sandoval).

This form will give me an idea as to how many tables will be needed per category, and how many total entrants there are.

SURVEY OF PROJECTS

Teachers, please mark down the total number of projects in each category. Return to Rhonda by Friday December 6, by noon. Thanks.

INVENTION CATEGORIES

Number of

_____ 1. Machinery
_____ 2. Personal Hygiene
_____ 3. Toys
_____ 4. Clothing
_____ 5. Travel — Recreation
Transportation
_____ 6. Office / School Supplies
_____ 7. Solar
_____ 8. Music
_____ 9. Household Projects
_____ 10. Pets
_____ 11. Plants
_____ 12. Medicine
_____ 13. Entertainment
_____ 14. Lens
_____ 15. Architecture
_____ 16. ? _____
_____ 17. ? _____
_____ * Total

SCIENCE FAIR CATEGORIES

Number of

_____ (1) Behavioral and Social Sciences
_____ (2) Biochemistry
_____ (3) Botany
_____ (4) Chemistry
_____ (5) Computer Science
_____ (6) Earth and Space Sciences
_____ (7) Engineering
_____ (8) Environmental Sciences
_____ (9) Mathematics
_____ (10) Medicine and Health
_____ (11) Microbiology
_____ (12) Physics
_____ (13) Zoology

* Total

Teacher's Name _____

Prep Period _____

Room No. _____

Total Number of Inventions _____

Total Number of Science Projects _____

This form will give me a count of how many Quality projects need to be judged. It will also be a record for possible Regional Qualifiers. Last, but not least, the categories will be matched up with judges with that expertise.

SURVEY OF TEACHER'S LIST OF PROJECTS TO BE JUDGED

THE BEST SCIENCE FAIR ENTRANTS
(to be premarked for judges).

Teacher's Name _____
Room Number _____
Prep _____

*Please return to Rhonda by Friday, December 6.

Student's Name	Category	Title of Project
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		
11)		
12)		
13)		
14)		
15)		

This form will be posted behind each project (top right side). A class schedule is needed so that the judges can talk to students if they need to.

INFORMATION TAG FOR EACH PROJECT

*Please xerox as many of these as you need for your classes.

NAME: _____

CATEGORY: _____

PROJECT TITLE: _____

CLASS SCHEDULE

CLASS	ROOM NUMBER
1)	
2)	
3)	
4)	
5)	
6)	
7)	

Grade: 6, 7, 8

SFVSC MEETING SUMMARY

Outline of Tasks for Science Fair

A. Set Up Time / Place / Date
Judges — Pre

1. Find judges
2. Type form letter
3. Xerox form letter
4. Head letter
5. Develop Judge Info Packet
   (a) Agenda
   (b) Survey
   (c) Judging criteria
6. Type and put Judge Info Packets together
7. Xerox all Judge Info Packets
8. Fold all materials
   (a) Invitation letter
   (b) Agenda
   (c) Survey
   (d) Judging criteria
9. Address envelopes
10. Stuff envelopes
11. Mail envelopes
12. Keep track of returned forms
13. Send Thank-You notes
    (a) Buy cards
    (b) Write on cards
    (c) Mail cards

B. Judging
1. Sign-in sheet
2. Coffee, donuts, juice in morning and throughout
3. Judge packets
   (a) Map of project locations
   (b) List of projects to be judged
   (c) List of judging criteria
   (d) Tally sheet
   (e) Clipboards and pencils
4. Luncheon $
   (a) Food
   (b) Drinks
   (c) Paper goods
   (d) Setup
   (e) Cleanup

5. Have students ready to be runners
6. Have paper and pencil (or form) for students to get needed students
7. Tally the tally sheets
   (a) List all winners 1 — 5 by student's name
8. Place ribbons on projects

C. Teacher Information
1. Let teachers know about Time / Place / Date
2. Workshop for Scientific Method
3. Binders for Science Fair / Invention info
4. Forms for teacher to return
   (a) Category Count
      (1) Typed
      (2) Xeroxed
      (3) Delivered
      (4) * Returned and tallied
   (b) Students'Entry Form
      (1) Typed
      (2) Xeroxed
      (3) Delivered
      (4) * Used to set up and find students
5. Awards
   (a) Awards — participation certificates
      (1) Xeroxed
      (2) Delivered
   (b) Extra participation ribbons
      (1) Ordered
      (2) Delivered
   (c) Ribbons
      (1) Ordered
      (2) Picked up
      (3) Placed on projects

D. Other Jobs
1. Gather tables
2. Set up tables
3. Set up category signs
4. Pin up signs
5. Set up Projects in correct category
6. Number each project
   (a) Make number cards
   (b) Place cards on projects and premark
7. Monitor students in area
8. Set up schedules for
   (a) Setup
   (b) Judging

(c) Parent viewing
(d) Students and faculty viewing

9. Gather judge score sheets
10. Record points
11. Record regional considerations
12. Distribute ribbons
13. Set up for parent viewing
    (a) Coffee, cookies, etc.
    (b) Present awards (must have master list)
    (c) Print, xerox fliers and deliver
14. Clean up after awards
15. Distribute blue ribbons
16. Distribute lost ribbons
17. Prepare list of winners for
    (a) Announcements
    (b) Newsletter
18. Gather need clipboards
19. Return need clipboards
20. Ask for table (from teachers)
21. Gather tables (from teachers)
22. Set up tables
23. Return tables
24. Buy
    (a) Name tags
    (b) Food / drinks / paper goods
    (c) Pins
    (d) Color-coded dots
25. Prepare packets for regionals
    (a) Form — students general information
    (b) Form — abstract
    (c) Letter of acceptance
    (d) Complete all information
    (e) Mail all information
26. Decide who goes to regionals
27. Set up mentors — teachers — students
28. Get projects to regionals
29. Set up deadline schedules

WASHINGTON MIDDLE SCHOOL

Information Regarding Judging

ALBUQUERQUE PUBLIC SCHOOLS
WASHINGTON MIDDLE SCHOOL
1101 PARK AVENUE, S.W.
ALBUQUERQUE, NEW MEXICO 87102-2967

DR. JACK BOBROFF
SUPERINTENDENT

JOSEPH M. VIGIL
PRINCIPAL
(505) 764-2000

November 12, 1991

Mr. David Menicucci

Dear Mr. Menicucci:

Washington Middle School is having it's Science Fair.

We would like to ask you to participate as one of our judges. The Science Fair is scheduled for Wednesday, December 11, 1991, and judging will begin at 8:00 A.M. and end at 1:00 P.M. However, we would also like to invite to you join us for lunch.

Enclosed is a "Judge's Information Form", which we would ask that you complete and return. Perhaps you are unavailable at this time, but are interested in helping in other activities, such as tutoring or mentoring--we would welcome your help.

If you would like to be a judge on Wednesday, December 11, please contact Mrs. Lynn Hightower at 247-3009.

Sincerely,

Rhonda Sandoval
Department Head for Science

/tvn
Enclosure

JUDGE'S INFORMATION FORM

NAME _____ PHONE NUMBER _____

HOME ADDRESS _____ ZIP CODE _____

COMPANY NAME _____

POSITION _____

COMPANY ADDRESS _____

COMPANY TELEPHONE NUMBER _____

EDUCATION (circle one): B.A. B.S. M.A. M.S. Ph.D.

MAJOR: _____

Please check one or more of the following:

____ I would like to be a judge at the Science Fair at Washington Middle School.

____ I am interested in being a mentor and/or tutor at Washington Middle School.

____ I am unable to be a judge at this time, please keep my name and phone number available for other forms of participating with Washington Middle School.

____ On behalf of myself or my company, I would like to present the following award(s):

Name of Award _____
Criteria for selection:

Form of Award: Plaque _____ Certificate _____
Cash Award (specify amount) _____
Other _____

PLEASE RETURN TO:
Rhonda Sandoval, Science Dept. (505) 764-2000
Washington Middle School
1101 Park Avenue, S.W.
Albuquerque, N.M. 87102-2967 C-15

JUDGES SCORE SHEET

JUDGES NAME_____

PROJECT #_____

CATEGORY_____

TITLE OF PROJECT_____

_____

RATING	Needs Improvement	Acceptable	Good	Very Good	Excellent	Total
POINTS	(2)	(4)	(6)	(8)	(10)	
Creative Ability	_____	_____	_____	_____	_____	x 3 = _____
Scientific Thought	_____	_____	_____	_____	_____	x 3 = _____
Thourough-ness	_____	_____	_____	_____	_____	x 1.5 = _____
Clarity and Dramatic Value	_____	_____	_____	_____	_____	x 1.5 = _____
Technical Skill	_____	_____	_____	_____	_____	x 1.0 = _____
						Total _____

Signature_____

Project #_____

Title:_____

_____

Comments:

1. What would have made this project better?

2. What was done well on this project?

3. Would you consider this project for Regionals? Yes No

WASHINGTON MIDDLE SCHOOL
SCIENCE FAIR
JUDGES BRIEFING

IMPORTANT! These contestants are 6th, 7th, and 8th graders. Don't expect graduate student work. On the other hand, don't be too soft-hearted. Take time to review enough exhibits to recalibrate yourself to mid-high level.

Interviews Ask Ms. Sandoval to get students for interviews: top 2-5 in category; all with potential to go to Regional Fair. Interview and rate by yourself. But, discuss with other judges.

Look at "Judges Score Sheet" in your packet.

Break judgement into five independent areas (not equally weighted):

1. **Creative Ability** (30%) Use interview to verify contestant's contributions versus helpers'.

2. **Scientific Thought** (30%) In Engineering, Mathematics, and Computer categories, consider engineering goals, or mathematical or computer methodology.

3. **Thoroughness** (15%) Better to thoroughly treat a bounded problem definition than to tackle too large a project.

4. **Clarity** (15%) This is the place -- and the <u>only</u> place -- where I give credit for the display.

5. **Skill** (10%) Again, in relation to what a mid-high student could be expected to do.

For each individual area, score as one of five ratings:

Rating	% Max
Excellent	100
Very Good	80
Good	60
Acceptable	40
Needs Improvement	20

Use the full range of ratings. The best you see here should get 100%, the worst should get 20%.

Do your arithmetic on the "Judges Score Sheet". Be sure to sign Score Sheet, then turn it in.

Two-way interaction with students. Emphasize positive suggestions for improvement. Verbal, or written on Score Sheet, or both.

To repeat the most important factor you must consider. These contestants are 6th, 7th, and 8th graders. Don't expect graduate student work. On the other hand, don't be too soft-hearted. Take time to review enough exhibits to recalibrate yourself to mid-high level.

Questions?

JUDGES' SCORING SUMMARY SHEET

Category(ies) Judged: _____

(PLACE A LARGE "X" AT POINT TOTAL FOR EACH LISTED PROJECT)

Number of Total Points								
100								
90								
80								
70								
60								
50								
40								
30								
20								
10								
Project Number								

WASHINGTON MIDDLE SCHOOL

Information and Handouts for the Parent / Student Science Fair Orientation Workshop

(Note: Washington also used materials supplied by Sandia in Appendix B)

PARENT SCIENCE FAIR WORKSHOP
OCTOBER 10, 6:30 PM - 8:30 PM
WMS CAFETERIA

AGENDA

OPENING REMARKS	– MARY MERCADO, WMS PRINCIPAL
INTRODUCTION OF SANDIA LABS SCIENCE FAIR VIDEO	– DAVE MENICUCCI, SANDIA LABS
MENTORSHIP PROGRAM	– DAVE MENICUCCI
STATIONS INTRODUCTION	– SUKI HARADA
STATIONS	– (ONE HOUR)

MESA	- TONI BARELA (INVENTIONS)
EXPERIMENTS	- TOM LYONS (STUDENT EXAMPLES)
JUDGING	- CHERRY ZIELAKOWSKI (STEPS AND CRITERIA)
ENGINEERING	- RHONDA SANDOVAL AND DAVE MENICUCCI
SCHOOL VIDEO	- STATIC DISPLAY

CLOSING	– RHONDA SANDOVAL AND DAVE MENICUCCI
REFRESHMENTS	

PER _____

Science Project Checklist

Name

Topic/Title

Protocol Needed	Rec'd
Human	
Animal	

Item	On Time	Late	OK/grade
Topic			
Experiment Plan			
Rough Draft			
Update			
Data/Conclusion			
Display Plan			
Abstract			

Science Project Timeline

KEEP THIS PAPER WHERE YOU WILL SEE IT EVERY DAY!

– Topic due

– Library for background research

– Experiment Plan due

– Rough Draft of library research paper due and Protocols due

– Project Update due

– Data and Conclusion due
Display Plan due

– Abstract due

– FINAL PROJECT DUE

Dec. 9 – School Science Fair

Final Project includes:
Abstract
Experiment Report including library research
Display

Experiment Plan

Name _____ Per. _____

"Working" Project Title _____

Purpose _____

_____

Hypothesis _____

_____

Materials Needed	Source	Cost

Procedure – Explain exactly what you will do. Be clear and be specific.

PROJECT UPDATE

IF YOU HAVE NOT YET BEGUN YOUR EXPERIMENTAL PROCEDURE:

START TODAY!!!!

Name _____ Per. _____

Project Title _____

Have you completed all your library research? _____
If no, **when** will your library research be complete? _____

Have you **completed** the experimental procedure for your project? _____
If no, what do you have left to do? _____

_____

_____

_____

Are you having any problems with your experiment? _____
If yes, please explain. _____

_____

_____

Have you organized your data into charts and/or graphs? _____

Have you begun to plan your display? _____
Have you gathered the materials for your display? _____

Have you arranged for transportation to get your project to school on the day it is due? _____

Do you foresee **any** reason your project will not be completed on time? ____
If yes, please explain (keeping in mind I don't accept late work!) _____

_____

_____

Science Experiment Report

Title

Name
Date
Per.

PAGE 1

Table of Contents

PAGE 2

Purpose or Problem

[what you tried to find out]

PAGE 3

Library Research
and Bibliography (books used)

*should be at least 2 pages, can be more

PAGE 4-5*

Hypothesis

[What did you predict would happen based on the library research? Why do you make the hypothesis that you do?]

PAGE 6

Materials and Procedure

[Explain exactly how you did the experiment and all the equipment you used.]

PAGE 7

Data

[show all the measurements and observations you made.

Include charts, graphs and pictures.]

**This section may be several pages long.

PAGE 8-?**

Conclusions

[Say what happened, what you learned. Explain any problems you ran into. Refer back to the hypothesis – were you right? Why or why not?]

LAST PAGE

Use ink for the final report. Check for spelling and grammatical errors. You may type or use a word processor if you know how and have one available.

Date _____
Source Topic _____

Abstract

Purpose: I chose this project on _____

because _____

_____

The question I wanted to answer was _____

_____

The problem I tried to solve was _____

_____

Hypothesis: My hypothesis is that _____

_____

Procedure: To do my research I went to the library and _____

_____

Experiment: I set up an experiment to see if _____

_____

Results: The results of my experiment _____

_____

Conclusions: _____

_____

_____

_____

SCIENCE FAIR PROJECT MEMO

Science fair projects are due _____ You will need your completed project, which includes your display box, report, abstract and experiment.

Your Science fair project will have a great impact on your grade.... So be prepared to do a GREAT presentation. You will be graded on ___ requirements. Each requirement will be graded on a scale of 0-4. 0 will constitute an F while a 4 will constitute an A.

GOOD LUCK - BE READY!!!!!!!!!!!!

WHAT JUDGES LOOK FOR

What to Do and Say

- Follow the scientific method as you describe your project.
- Practice presenting your project to your family and friends.
- Be neat in appearance and polite in manners.
- Speak to the judges as conversation partners. Look directly at them. Speak slowly. Be sure they understand you.

WHAT JUDGES LOOK FOR

A. Originality. Your ideas. Project appeal. Be as creative as you can be!

B. Accuracy. Exactness. The truth that you have discovered. How closely did you follow the scientific method?

C. Completeness. Do you understand everything you've done? Have you done everything down to the last detail? Can you explain it?

D. Results. Did you end up with knowledge that is important to you?

_____
Student Signature

_____
Parent Signature

YOUR SCIENCE FAIR PRESENTATION TO THE JUDGES

Do not memorize your presentation. You may initiate the presentation or the judge may take the initiative by asking specific questions.

1. Introduce yourself. "Hello, my name is _____."
2. Give the title of your project. "The title of my project is_____."
3. Explain the purpose of your project. "The purpose of my project is _____ _____."
4. Tell the judges how you got interested in the topic.
5. Explain your procedure. "The procedure that I followed was _____."
6. Show your results. Explain your charts, graphs, or notebooks.
7. List your conclusions. Explain what you have proven. If you think you had some problems or errors in your experiments, don't be afraid to admit these.
8. Tell the judges what you might do in the future to continue your experimentation. What would you have done differently if you were to do the project again?
9. If you do not know the answer to a judge's question, then say, "I'm sorry, but I don't know the answer."
10. Thank the judges. Always remain composed.

OTHER TIPS FOR PRESENTING

1. Practice your presentation to your parents, teacher, brothers and sisters, neighbors, friends, or your dog. Be comfortable and confident. You know alot about your project.
2. Wear your best clothes. Look your very best.
3. Look straight into the eyes of your judges. Pay attention to the judges.
4. Stand to the side of your exhibit.
5. Do not chew gum or candy.
6. Speak loudly enough to be heard by all the judges.
7. Smile.
8. Be polite.

CHECKLIST FOR A SUCCESSFUL SCIENCE FAIR

1. Introduce science fair idea. Invite guest speakers (Visiting Scientists Program) to spark interest.

2. Identify school committee consisting of science and math teacher representative, librarian, principal, etc. Include parents and students if possible.

   Specific duties should be assigned and should include:

   - reserving date, time, place for local fair and open house.
   - arranging for judges (see sample letter and forms this section); hosting judges.
   - identifying awards and possible sponsors (certificates may be printed by Monroe Graphics, APS).
   - informing parents. It should be their responsibility to transport students if necessary.
   - arrangements should be made for school science fair coordinator and students to be excused from classes during day of fairs.
   - awards presentation

3. Develop Timeline. Find out dates for State and Regional Science Fairs and work backwards. First protocol review for live animal experimentation is early in November. Students should select topic by early October.

4. Involve principal and librarian early in planning stages.

5. Inform students of Judging Criteria.

"Tomorrow's Scientists are in Today's Schools"

— National Science Foundation

Things I need to do to improve my project!!!

_____ Get a better box.

_____ Cut the edges of my box more neatly.

_____ Paint my box better inside and outside.

_____ Cover my box better inside and outside.

_____ Use larger letters for my topic headings.

_____ (Use stencils to make my letters neat.)

_____ (Cut my letters out of construction paper.)

_____ Use more pictures (cut them out from magazines.)

_____ Use more graphs (neat and useful).

_____ Use more drawings (colorful and neat).

_____ Arrange my display neatly.

_____ Rewrite or type my abstract on nice paper.

_____ Rewrite or type my report on nice paper.

_____ Rewrite or type my results on nice paper.

_____ Rewrite or type my summary on nice paper.

_____ Practice presenting my project to someone (3 — 5 minutes long only!)

OTHER THINGS I NEED TO DO: _____

_____

_____

_____

WASHINGTON MIDDLE SCHOOL

Handout Materials for the
Teacher's In-Service
Science Fair Training

PRESCRIPTION FOR SUCCESSFUL SCIENCE FAIR PARTICIPATION

1. Positive commitment by teachers involved.

   - Decision should be made if projects will be mandatory.

   - Projects must be by individual students; group projects are not admissable beyond the local school.

   - Teachers must provide guidance and certify the project for further competition. Thus, when the teacher signs the sponsor's form they are giving approval of the quality and appropriateness of the project. Students should be encouraged to exhibit only their very best effort.

2. Clear communication (in writing) to students about

   - What a science project is.

   - What is expected of them.

   - What the timelines are.

   - Where they may go for help.

   - How much help they can get.

3. Continuous encouragement and follow-up

   - Schedule 10-15 minutes at least twice a week for discussions of students' progress, ideas, etc.

4. Use available resources: Teacher, librarian, a science fair contact person, parents, and professionals in the community.

5. Science department or school staff should identify a science fair committee:

   - to provide information to students and teachers

   - to plan logistics for setting up the fair exhibits

   - to arrange for judges and awards

   - to plan logistics for judging projects

6. Involve parents by making them aware of students' pursuit of project. Provide for public display of projects (i.e. open house, PTA, school newspapers, parents' newsletter, etc.)

MAIN FOCUS is not to be a top winner, but to get the students involved, to participate.

WASHINGTON MIDDLE SCHOOL

Information from the
Science Fair Mentoring Program

WASHINGTON MIDDLE SCHOOL
SCIENCE MENTORING GUIDELINES
1991-1992

Welcome to the Washington Middle School Science Mentoring Program. We are glad to have you as a mentor, and we hope this will be a positive experience for you and the student(s) with whom you will be working.

The goal of the Mentoring Program is to increase the quality of the student science projects presented at the Regional Science Fair, and with an extended goal to promote more representatives selected for the State Science Fair. This can only be done by continued development of the students' self-esteem and confidence, and by teaching extended strategies in science problem-solving throughout the refinement of the project. "Si se puede" (it can be done) needs to be the standard for the students rather than the exception. You, as a mentor, can be instrumental in helping to continue the students success.

A mentor is a successful citizen interested in realizing the potential of the youth. Research shows that students, who have a parent or other adult challenging and supporting them, score higher in thinking/reasoning skills. You, as a mentor, will primarily act as a role model. Most Washington students have had limited exposure to science experimentation development, and you may be able to broaden the experience base of your protege. You will be able to provide support, encourage educational goals, share experiences and activities, and become an adult friend of a young person. You will not have to be an "authority figure" or a parent replacement. In short, you get to have the fun.

The information attached is designed to give you some direction in working with your protege. You are not limited to the activities suggested nor are you expected to participate in each one. Rather, you may use the suggestions as guidelines to find mutual interests.

We ask that you phone you protege at least once a week and meet in person at least once a week up to the date of the Regional Science Fair, March 13, 1992. Each student has been asked to call if an appointment must be cancelled or reschedules, and we ask the same of you. We hope you and your protege will have a mutually rewarding experience.

A MENTOR IS:

A PROFESSIONAL ROLE MODEL
A MOTIVATOR
A RESOURCE TO THE STUDENT
A HELPING HAND
A FRIEND

WHAT WILL MENTORS DO:

GET IN TOUCH WITH STUDENT AND HAVE A TALK
ASSESS HOW TO HELP A STUDENT-MAKE A LIST
- assist in setting up experiment
- develop timeline with regular check points
- check daily log on experiment process

CONTACT STUDENT AT LEAST ONCE A WEEK
- "How are you doing?"
- "What have you accomplished, RE: project?"
- "What's holding you back on this or that?"
- "Let's think together about how I can help."

WORK WITH STUDENT TO KEEP HIM/HER ON TRACK

PHONE TIPS

PREPARATION
FRIENDLY GREETING
SMALL TALK-ICE BREAKER
OPEN-ENDED QUESTIONS
- "Tell me more...", "Share with me...."

PROBING
- "Tell me more...", "That's interesting, please go on..."

SOLICIT MULTIPLE RESPONSES
- "What kinds of things....", "Which ones interests you?"

MENTORSHIP IS-

Helping parents and teachers guide student in completing revisions on their science project.
Giving students tips on success once he/she sets a focus on revisions.
Being a successful role model.
Supporting students in finding resources for project improvement.
Acting as, or leading a student to reliable sources of information as needed.

PROFILE OF A MENTOR:

Willing to contact student a minimum of once a week.
Willing and able to make a significant intervention toward success of the student.
Able to focus and persevere.

EXPECTATIONS

STUDENTS	MENTORS	PARENTS	TEACHERS	COORDINATORS
To express feeling, desires, expectations of working with mentors. Treat mentors with respect. Be courteous and polite. Be honest and open. Commit to having a successful personal/working relationship Complete assignments and activities on time. Inform mentor if unable to keep a scheduled appointment. Overall commitment to the success of the program and self. Keep a progress log of experiment and project. Keep folder and calendar up to date and check items off when they are complete. Bring folder to all meetings with mentor and teachers. Responsible for all materials at all times.	Contact student minimum of once a week. To express feeling, desires, expectations of working with students. Treat students with understanding and respect. Assist student in organizing materials for project, including scientific method, experimenting, graphing and data collection and charts. Commit to having a successful personal/working relationship. Assist student in using resources outside the classroom in order to complete assignments (recommending outside resources). Inform student if unable to keep a scheduled appointment. Serve a positive role model. Keep calendar of planned student mediation time. Final critiques	Express an interest in the program and what the program provides for the student. Support the mentor by encouraging the student and participate in needed area of support. Read, return, and respond to correspondence sent home. Attend scheduled conferences or meetings. Keep open communication with mentor concerning activities and deadlines and scheduled meetings.	Remind students to complete projects on time and meet deadlines. Allow classtime for mentor to work with student if necessary. Give students mentor/workshop reminder notes. Critique students' project at least 3 times prior to completion due date. Be available to help in support areas such as xeroxing, typing, etc. Help students to have a professional looking project. Prepare students for judge interviews and schedule time for student project presentation(perhaps with other classes).	Serve as a liaison with school, mentor, student, parent. Keep a line of communication between mentor, student and parent. Provide materials, supplies, books, etc., necessary for tho success of the program. Evaluate program. Provide students class schedules and home phone for mentor or place where student can be contacted.

COMMITMENT REQUIRED

Both participants in this experience agree to try to fulfill their duties and make a personal commitment to succeed in the relationship.

Duties of a Mentor

1. Make a list of goals which you and your protege hope to accomplish.
2. Set a timeline for completion of project objectives and goals.
3. Meet once a week and/or a phone call to evaluate progress, address problems, determine solutions, and maintain timeline completion.

Duties of a Protege

1. Make a list of goals which you and your mentor hope to accomplish.
2. Set a timeline for completion of project objectives and goals.
3. Meet once a week and/or a phone call to evaluate progress, address problems, determine solutions, and maintain timeline completion.

BUILDING RELATIONSHIPS THROUGH GOAL-RELATED ACTIVITIES

One of the best ways to build the mentor/protege relationship is for the pair to participate in enjoyable activities.

Field trips around the community to observe resources relative to project.

Visit to mentor's work place

Dinner in the mentor's home

Talking about important experiences in your live

Talking with adults in protege's project area

Provide positive feedback on completion of timeline goals

GUIDES FOR EFFECTIVE MENTOR

1. Establish a warm, genuine, and open relationship.
2. Keep in frequent contact with student; take the initiative, don't always wait for students to come to you.

   Consider taking student to work to tour facility and discuss job opportunities.
3. Monitor student's progress toward project goals.
4. Be realistic with student.
5. Encourage students to consider/develop alternative directions when appropriate.
6. Encourage student to talk by asking open-ended questions.
7. Don't make decisions for students; help them make their own.
8. Focus on student's strengths and potentials, rather than limitations.
9. Provide accurate information.
10. Be a good listener.

GUIDELINES FOR MENTORS TO HELP STUDENTS ACHIEVE GOALS:

Monitor student's study time by having student keep a record of time spent on project.

Assist student in organizing materials for project development.

Assist student in using resources outside the classroom in order to complete project (recommending outside resources).

Serve as a positive role model.

Provide materials, supplies, books, etc., necessary for the success of project.

MENTOR PITFALLS

Many mentors will undoubtedly encounter the temptation to go beyond the minimum expectations in their relationships with the students. Please be aware that good intentions can, at times, backfire. Here are a few warning signs:

Your sole responsibility is to your student, NOT his/her family, too.

Short, but regular contacts accomplish much more for the student than lengthy but irregular get together. Quantity is as important as quality.

Remember, we are not trained and not expected to be social workers.

Mentors are not expected to make a large financial as well as personal contribution.

Only break an appointment with the student because of an emergency. Trust will be crucial to the relationship, and nothing undermines trust quicker than broken appointments.

Be careful to initially establish guidelines for each contacting the other: both-too difficult and too easy-patterns of communication can breed misunderstandings.

Be conscious of goals and accountability in your relationships.

WHAT IS A MENTOR?

The words "MENTOR" has a Greek root meaning "steadfast and enduring." a *Mentor* should be a caring person who establishes a relationship with you over a period of time in order to provide support and assistance in setting goals, making decisions, or resolving problems. Traits which we hope mentors will exhibit are listening, nurturing, and supporting. They are not a replacement for your parents.

Some activities in which your mentor might want to be involved are:

- evaluating your science project
- suggest refinement/extension of project for Regional Science Fair
- assist in setting up experiments
- suggest logging documentation procedures
- problem-solve experiment outcome/gliches
- assist in redesigning/writing of research paper/display board
- provide fieldtrip to community/work resources
- provide fieldtrip to personnal work site

WHAT IS YOUR ROLE?

You, better than anyone else, know hat help you need. Research shows that students, who have a parent or other adult challenging and supporting them, score higher in thinking/reasoning skills. Mentors have opportunities to relate to you in unique ways. They are not "authority figures.: They maybe be wonderful role models, however, who can share experiences, guide you in difficult decisions, and be an adult friend.

We hope you and your mentor will form a positive relationship. Remember that both parties must work toward this goal. We know that you will treat your mentor with respect. If you are unable to keep a scheduled appointment, you will call and cancel. Hopefully, your mentor will call/meet with you at least once a week. If this doesn't happen, call your mentor. Continuing communications is critical!

At your first meeting, you will want to exchange phone numbers and learn something about each other. What do you want your mentor to know about you? Make a list before you go. What do you want to know about your mentor? Include it on your list. Find the best times to get together. Be ready to discuss an area where you can use some help. Encourage your mentor to call school if more assistance is needed.

SOME ANSWERS TO COMMON PARENT QUESTIONS ABOUT MENTORING

What should I do if my child cannot make it for a meeting with the mentor?

You can encourage responsibility in your child, by having him/her call the mentor when a meeting must be rescheduled. If your child is very ill, you may want to call yourself. Be sure that you have the phone numbers necessary to reach the mentor both at home and work.

What if family plans conflict with the mentor and youth meeting?

The role of the mentor should be one of complementing or adding to opportunities for growth already available through the family. Time with the mentor is essential for completion of the science project. It would be helpful if you let the mentor and your child know when you have planned family events.

SUGGESTIONS FOR WHAT TO SAY

Here are some topics to consider sharing with students about yourself and your job.

WHAT YOU NEED TO DO

- job description
- major tasks, sub-tasks
- equipment or tools you use
- description of your typical day

WHAT YOUR WORK IS LIKE

- working hours
- salary range for this type of occupation
- fringe benefits (health insurance, retirement, credit unions, etc.)
- working environment (noise, hazards, lighting, travel, special clothing, etc.)
- history of this kind of work
- What you produce (goods, services)
- interdependence of your job and other jobs/products/industries
- Where else in the community your kind of work is done
- government regulations affecting your work

THE FUTURE IN IT

- degree of opportunity for women and men regardless of race
- opportunities for advancement
- personal qualities needed
- employment projections; effects of technology; new knowledge on your work
- effects of the country's economic condition on your job
- hints you would give someone applying for your job
- other jobs you could do with these same skills

JOB ENTRY

- how you got started in this job
- other jobs you have held
- skills you already had that you use now; how you acquired them
- your recommendations to others for acquiring these same skills
- your job as a lifetime career or a stepping stone
- relate jobs for which you are now prepared

HOW IT FEELS

- what you like and dislike about the job
- What you would change if you could
- avenues available to you for making suggestions on the job
- what you would rather do if you're not satisfied
- interpersonal skills you find most important and why
- underlying attitudes and values important to your job
- why you chose this type of work (with machines instead of people, for example)

HOW IT AFFECTS YOUR PERSONAL LIFE

- family time
- leisure time
- job-related skills you use elsewhere
- expanding interests
- adequate exercise
- general health
- tension-fatigue vs. stimulation-fulfillment-increase in energy

BAD AND GOOD LISTENING HABITS

BAD LISTENING HABITS	GOOD LISTENING HABITS
• Closing your mind by calling the message "uninteresting"	• Opening your mind to see if there's anything in the message you can benefit from
• "Putting down" the speaker -- the way he/she speaks, dresses, gestures, etc.	• Getting the speaker's message which is more important than his/her delivery or dress
• Planning what you will say when it is your "turn" to speak -- your rebuttal, judgment	• "Hearing the speaker out" and delaying judgment
• Listening for facts only	• Listening for facts, concepts, main ideas, and feelings
• Trying to outline everything the speaker says	• Listening a few minutes to determine the speaker's organization
• Faking attention to the speaker	• Spending energy listening, instead of pretending to listen
• Creating or tolerating distractions	• Creating a positive listening environment -- asking the speaker to talk louder, close a door, etc.
• Avoiding listening to difficult material	• Practicing listening by trying to understand difficult material
• Letting a reaction to words used by the speaker inhibit your listening	• Identifying words that might cause a negative reaction, and doing something about it

Source: Pam Wilson, coordinator for the Mentor Project

REGIONAL SCIENCE PROJECT TIMELINE

JANUARY

Monday	Jan 6	-	Announcement of potential students
Tuesday	Jan 7	-	Regional Candidates Meeting, 8:30a Commitment letters due
Wed	Jan 8		Commitment Parent Ltrs due
Thurs	Jan 9		Mentor Workshop, 6:30p
Friday	Jan 10	-	Protocols Due
Saturday	Jan 11	-	Mentor's Workshop
Thursday	Jan 16	-	Student-Mentor-Parent Get-together, 6:30p
Saturday	Jan 18	-	Free Weekend-Monday Holiday
Saturday	Jan 25	-	Student-Mentor Workshop, 9a - 12p

FEBRUARY

Saturday	Feb 1	-	Student-Mentor Workshop, 9a - 12p
Saturday	Feb 8	-	Student-Mentor Workshop, 9a - 12p
Saturday	Feb 17	-	Free Weekend-Monday Holiday
Friday	Feb 21	-	All written reports due/Abstracts Due
Saturday	Feb 22	-	Student-Mentor Workshop, 9a - 12p
Mon-Thur	Feb 24-27	-	Teacher Edit Reports
Friday	Feb 28	-	All written data/graphs due
Saturday	Feb 29	-	Student-Mentor Workshop, 9a - 12p

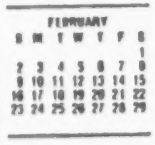
MARCH

Mon-Fri	Mar 2-6	-	Board Set-up after School, 3-4:30p
Thursday	Mar 5	-	Interview Schedule/Student List to Tchrs
Friday	Mar 6	-	All typing completed - reports/abstracts Final copy of graphs/charts/word strips
Saturday	Mar 7	-	Laminate materials Final Backboard Set-Up with Mentors, 9a-3p
Mon-Tues	Mar 9-10	-	last-minute touch-ups, 3-4:30p Permission slips home
Tues	Mar 10	-	Permission slips due
Tues-Wed	Mar 10-11	-	Staff-Mentor Evaluation/Questioning, 3-4p
Thurs	Mar 12	-	Parent/Student/Mentor Set-Up/Check-In Johnson Gym - Leave School 3:30p Briefing-dress/lunch/behavior/car-pool 3p Absence list to attendance secretary
Friday	Mar 13	-	Regional Science Fair Judging, 7a - 4:30p Student Participants Report to Johnson Gym 7:00a- get items out of security, display item final set-up
Saturday	Mar 14	-	Regional Science Fair Awards Assembly Popejoy Hall, Univ of New Mexico 8:30a-12p
Monday	Mar 16	-	Project Display, Washington Middle School
Tuesday	Mar 17	-	Evaluation/board clean-up, 3p rm 205
Wed	Mar 18	-	Final board clean-up, 3p rm 205
Thursday	Mar 19	-	Student-Mentor-Parent Potluck Dinner 6p, Washington MS Cafeteria

FINIS

JOB WELL DONE

JANUARY 1992

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1892-1992 CENTENNIAL ABQ PUBLIC SCHOOLS			New Years Day 1	2	3	4
5	A, B, & E track begins Jan. 6 6 Announcements → Orientation, Registration, All High Schools, No Classes, Jan. 6 & 7 Written Note to Students	D-track begins Jan. 7 7 - Student Meeting 3:00	letters due 8	9 Mentor Meeting - 6:30	10 Protocol's Due.	11 Mentor Meeting - 9:00 a.m.
12	Staff Meeting 13	14 Staff Reports Student Holiday Registration: Elem. and Mid. Schools Grades	Mentor - Parent - Student Get-together 15 Parent Permission Slips	16 → 6:30 on Thursday 16th Room 205	17	Tree 18
19	Martin Luther King Holiday 20	21	School Nurse Day 22	23	24	SAT (Scholastic Aptitude Test) 25 Mentor Workshop 9:00 a.m. - 12:00 p.m.
26	B-track ends Jan. 27 27	28	C-track begins Jan. 29 29	30	31	

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FEBRUARY 1992

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1892-1992 CENTENNIAL APS ALBUQUERQUE PUBLIC SCHOOLS						American History Month Feb. 1-29 American Music Month Feb. 1-29 Black (Afro-American) History Month Feb. 1-29 1 Mentor Workshop 9:00a.m. 12:00p.m.
National School Counseling Week Feb. 2-8 2	3	4	5	6	7	ACT (American College Test) 8 Mentor Workshop 9:00a.m.- 12:00p.m.
9	10	11	12	13	A-track ends Feb. 14 14	Free 15
16	President's Day 17	18	19	20	All WRITTEN Reports DUE Abstracts 21	Mentor Workshop 9:00 a.m- 12:00 p.m. 22
23	24	25	26	27	All Written Data + Graphs Due 28	Mentor Workshop 9:00 a.m. 12:00 p.m. 29

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Teacher Editing

MARCH 1992

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Music in Our Schools Month March 1-31 National PTA Drug and Alcohol Awareness Week March 1-7 National Nutrition Month March 1-31 **1**	National Women's History Month March 1-31 Newspaper in Education Week · March 2-6 **2** After-School 3:00 - 4:30 p.m.	**3**	**4** Set-Up Begins →	Interview Schedule Send-Student List to Teachers **5**	Abstract All Reports Graphs, Pictures Word-Strips - Data Charts DONE ! Typed **6**	Laminate Backboard Set-Up Workshop 9:00 - 3:00 **7**
8	**E-track ends March 9** **9** Touch-ups 3:00 - 4:30	**10** Interview Drills Staff	**A-track begins Mar. 11** **11** Mentor Eval. 3:00 - 4:00	**12** Parent/Student Set-Up - Johnson Gym 3:30	ALL DAY 7:30am - 4:30pm **13** Regional Science Fair @ UNM Judging	**14** Popejoy Hall @ U.N.M. → 8:30am - 12:00p. Awards
15	Project Display In Hall **16** **High School Holiday Only No Classes Mar. 16 & 17**	**17** Evaluation 3:00 Room 205 → Board Clean-Up 3:00	**18** Room 205	**B-track begins March 19** **19** Mentor, Stylist, Parent. Pot-Luck	**20**	**21**
Art Week March 22-28 **22**	**23**	**24**	**25**	**26**	**27**	**28**
29	Parent/Teacher Conferences Mar. 30-April 3 **30**	**31**				

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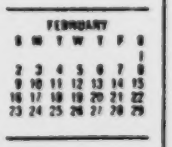

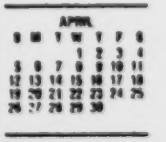

1892-1992 CENTENNIAL APS ALBUQUERQUE PUBLIC SCHOOLS

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REGIONAL PARTICIPANTS - MENTORS

Mrs Gorman: 293-6228 School:764-2000 Ms Skl: 299-2077

STUDENT	MENTOR	PHONE
Kimaree Crespin Maria Burgos	Mrs. Mary Crespin	(wk) 841-1175
Steve Maestas Rudy Borroel	Doug Adkins	(wk) 844-0611
Tony Rodriguez Lawrence Bernal	Byron Dean	(wk) 844-6028
Michael Corral Anthony Jio	Britt Nance	(wk) 255-3781
Cielo Garcia Georgina Casillas		
Tony Gomez Kelley Rodriiguez	Dave Menicucci	
Henry Chavez Michelle Bourguet	Mark Birkhauser	(wk) 841-8881
Monica Gonzales Jocinda Pena	Lynn Hightower	247-3009
Angelica Barnett Karina Garcia		
Shawn Hightower Tyra Vaughn	Susan Gant	
Wayne Fields Vivian Munoz/Jessica Soto*		

ALBUQUERQUE PUBLIC SCHOOLS
WASHINGTON MIDDLE SCHOOL
1101 PARK AVENUE, S.W.
ALBUQUERQUE, NEW MEXICO 87102-2967

DR. JACK BOBROFF
SUPERINTENDENT

Mary Mercado
PRINCIPAL
(505) 764-2000

May 26, 1992

Mr. Dave Menicucci
1521 San Carlos SW
Albuquerque, NM 87104

Dear Mr. Menicucci:

We wouid like to say once again, "THANK YOU," for a terrific experience with our students at Washington Middle School. We learned a lot, and see positive results in the quality of our students projects. We look forward to next years science fair.

Although few of our students were recognized for their time and quality of project, we feel they learned a lot and had a rewarding experience through community interaction and development of cross-generational communication skills. They made a commitment, and learned to interact with adults in specific job related fields of study. This enhanced their knowledge of vocations and education needs. They shared their learning experiences with us, and their excitement was obvious.

We hope you will be available for next year. We are enclosing a questionaire for evaluation of this years experience, and to develop focus for change next year. We hope to continue to develop the mentoring project, and see continued growth in our students abilities.

We apologize for this late recognition as the year has passed ever so quickly. We do appreciate your time and talents volunteered for our students. We look forward to seeing many of you again next year. Have a relaxing summer.

Cordially yours,

Mrs. Sue Gorman
Ms Cherry L Zielaskowski

WASHINGTON MIDDLE SCHOOL - MENTORING PROGRAM
NW REGIONAL SCIENCE FAIR PARTICIPANTS

Please give **both positive** and **negative** responses.

1. What were the key points of strength and weakness in the mentoring guidelines?

2. What needs to be developed for the mentoring workshops?

3. Would you be interested in working with a Science Fair Club after school next year?

4. What types of pre-workshops for the students would you suggest for student preparation next fall?

5. Would you be available for mentoring again next year? or know others who would also?

Name _____ **Phone**_____
Address_____ **ZIP**_____
Specialty expertise _____

Please return to:

Ms Cherry Zielaskowski
Mentoring Program
Washington Mid School
1101 Park Ave., SW
Albuquerque, NM 87102-2967

Appendix D:
Science Fair Resource and Organizational Materials Developed by Taylor Middle School SFVSC

Copies of Minutes of SFVSC Meetings D-3
Copies of SFVSC Correspondence and Promotional Materials D-19
Copies of SFVSC Handout Materials from the
Science Fair Parent/Student Orientation Workshop D-25
Copies of SFVSC Materials Relating to Judging D-29

TAYLOR MIDDLE SCHOOL

Copies of Minutes of SFVSC Meetings

TAYLOR SCIENCE FAIR MEETING NOVEMBER 21, 1991

Minutes taken by Irene Lueckenhoff

Welcome by Coordinator Jan Lewis

Individuals present:

Elizabeth Cochran
Dan Irick
Grant Bloom
Col. John Miller
Dave Menicucci
Rauline Gutierrez
Gary Carlson
Jan Lewis
Irene Lueckenhoff
Joyce Sitten

Report from Sandia Representative Dave Menicucci:

Dave reviewed the purpose of the Science Advisory Program. It is to assist Taylor in putting together an internal Science Fair Organization. He emphasized the need to document specifics of our program for future use.

Dave introduced Gary Carlson from Sandia who will help Taylor with technical aspects of Science Fair.

Colonel John Miller, representative from Kiwanis Club, will solicit help from retirees.

Science Fair Workshop Procedures:

Dave and Jan Lewis jointly explained the concept of a Science Fair Workshop. It would involve a period of time after school hours when trained individuals help to answer questions related to various aspects of the Science Fair.

Tentative workshop stations include:

- Display
- Judging
- Engineering
- Scientific Process
- Protocal
- Project Selection & Preparation
- Assistance for students with special needs
- Research

Jan will get preparation packets to individuals manning stations and extra information packets will be housed in the library for check-out.

A brief hand-out will be available in each station as well as one copy of detailed information for viewing at the station only.

Workshop date is not finalized. Recommended dates are December 10, 11 or 12th. Time period will be 3 hours - after school from 3:15 to 6:15.

A snack will be provided for those attending workshop.

Science Fair Logistics:

Students will need to fill out a Science Fair Registration Form for record keeping and also to phone students regarding current information.

Written reminder will be sent home with students on the day prior to workshop.

Dave suggested we figure out budget based on determined needs. Dan Irick then volunteered to chair a Budget Committee. This committee will present needs to Colonel Miller of the Kiwanis Club. They have about $100 to donate upon official request.

We need to think of whom we can approach for further financial assistance.

Pauline Gutierrez volunteered to chair a Logistics Committee to address such topics as workshop and Science Fair organization, food, calling, awards etc.

Elizabeth Cochran's secretary will type any necessary information.

Science Fair - General Information:

$200 has been donated to Science Fair by Taylor PAC.

School will pay for table rental.

Display boards will be available for purchase. Cost will be approximately $6.50.

Future Science Fair Related Dates:

Next meeting to finalize workshop is set for December 3rd at 7:30 p.m.

Second workshop will be held in early January to bring in projects for mentoring.

Gary Carlson mentioned the possibility of another workshop following local Science Fair judging.

TAYLOR SCIENCE FAIR MEETING DECEMBER 2, 1991

Minutes taken by Irene Lueckenhoff

Welcome by Coordinator Jan Lewis

Individuals present:

Elizabeth Cochran	Linda Banker
Joyce Sitton	Irene Lueckenhoff
Dan Irick	Dave Stryker
Becky Pate	Pauline Gutierrez
Gary Carlson	Dave Menicucci
Dave Ring	Jan Lewis
	Mr. Mulder

Report from Budget Committee:

Dan Irick reported that the committee estimated a Science Fair budget of $300. Copying costs were estimated at $150 and the remainder for food, badges, ribbons, awards, etc.

A formal letter was written to Kiwanis Club and signed by Mr. Mulder.

FINALIZED SCIENCE FAIR WORKSHOP INFORMATION:

Registration forms to be sent home are in teachers' hands today.

PAC will meet tomorrow at 8:45 a.m. to approve money for display board ordering.

Final Workshop preparation meeting will be held on Tues., Dec. 10 at 7:30 p.m.

Workshop will be held on Thurs., Dec.12 from 3:15 to 6:15 p.m. Stations will be manned by the following individuals:

Gary Carlson	-	Scientific Method
Dan Irick	-	Engineering
Pauline Gutierrez	-	Research
Elizabeth Cochran	-	Display
Ron Pate	-	Project Selection
Dave Ring	-	Judging
Adrienne Podlesny	-	Protocal
Sandy Rhinehart	-	Special Needs

Dave Menicucci will act as a floater. Col. Miller will be asked to send additional helpers.

Each station will be located in a seperate classroom. Workshop will be launched in the school cafeteria.

Dave Menicucci will make a brief introduction. Adrienne Podlesny will present an overview.

Science Fair video will be shown and then run continuously during workshop.

Irene Lueckenhoff will solicit snack donations and set snacks up in cafeteria.

There will be a sign-in sheet for students at each station. Teachers may consider giving extra credit to students who attend workshop.

Linda Banker will make up a sign-in form.

Jan Lewis handed out information packets to those who will man stations.

Gary Carlson will ask his son to be present at the workshop, representative of a student having gone through the process.

Joyce Sitton needs to know what pages of the handbook need to be run off for hand-outs. Mr. Mulder suggested we use the Taylor copier.

Jan will write up motivational announcements to be read over PA system for the next few days. Jan and Joyce will place Science Fair Workshop information in the display case.

SCIENCE FAIR CONSIDERATIONS:

Judging - Dave Ring has 14 judges lined up and is planning to get 20.

Science Fair projects are due on Feb. 18th. Judging will take place on Feb. 19th and 20th - tentative time 4:00 to 7:00 p.m. Taylor students will view projects on Feb., 21st.

Dave Ring wanted to know how we were going to group projects. It was decided that we will not categorize for this judging. We would later work with winning individuals to help them target in on available awards at regional level. Jan will go down to Regional Office for list of available awards.

John Hockert is working on a Judge's Manual. It will be finished after January 1st. There will also be a training session after January 1st.

Food - No final decision was made regarding food to be served. Pauline Gutierrez and committee will discuss matter further, possibly consider potluck for both evenings.

AWARDS - Pauline reported that the estimated cost for pins would be $4.75. Buttons would cost about $.40. Mr. Mulder informed us that we could use the school button maker.

Buttons and ribbons can also be made by the APS Graphics Department.

Dave Menicucci will print a master participant certificate.

DISPLAY BOARDS - Mr. Mulder gave Jan information on a company that might send boards in time to sell at Workshop.

Students will at least be able to order them at Workshop. Cost will be $6.50.

Teachers will submit a list of students who are unable to purchase boards.

BANNERS - Signs for Workshop will be printed out by Linda Banker. She will also make any necessary signs for Science Fair.

TAYLOR SCIENCE FAIR MEETING December 10, 1991

Minutes taken by Irene Lueckenhoff

Individuals present:

Joyce Sitton	Linda Banker
Jan Lewis	Irene Lueckenhoff
Chuck Easterling	Mimi Tafoya
Col. John Miller	Dave Menicucci
Ron Pate	Elizabeth Cochran

FINALIZED SCIENCE FAIR WORKSHOP BUSINESS:

Dave Menicucci will bring videotape and make introductory speech. Jan Lewis will welcome students. Adrienne Podlesny will present an overview. Mr. Johnson will then introduce Taylor Science Dept.

Linda Banker has made banners for each room and labels for each station.

Rooms for workshop use will be 118, 208, 209, 304, 308, 309, 406.

Dave mentioned that the most popular station will be project selection. There is need for additional help and lots of handouts. Colonel Miller volunteered to assist in this station.

Gary Carlson will bring in his son's winning project to be displayed in the cafeteria. Jan's daughter's project will be displayed in special needs station.Katie's will be in the display station.

We have about 54 display boards. We will have a sign-up for purchasing boards. We will also have a sign-up sheet for purchasing headings. The cost is estimated at $.35.

UNFINISHED WORKSHOP BUSINESS:

A written reminder was supposed to have gone home with students today. Mr. Mulder will check on matter.

Colonel Miller needs to send a letter stating what the Kiwanis money donation will specifically be used for in order for this committee to keep money in Taylor School account.

We will need a large portable screen for workshop presentation.

Ron Pate needs copies of the list of suggested Science Fair Projects for his station.

Mr. Mulder requested that we find someone to walk the halls during workshop. Elizabeth Cochran's son may be available to do that.

We need to change Room 118 as a station if possible.

Linda Banker will make a banner for Monzano Sunrise, Northwest Club of Kiwanis International.

SCIENCE FAIR INFORMATION:

Channel 27, Public Access Television, will be called for coverage.

Dave has written a press release to be sent to the newspaper.

We need to keep Science Fair notices going out to students who rotate out of Science classes.

Colonel Miller needs to know who we need of his members.

We will contact program manager at KMNE.

GENERAL INFORMATION:

Students needing assistance with graphics may approach Lanore Durrett in the Art Dept.

The Science Fair Handbook can be recopied. Might have a sign-up sheet and sell for $7.95.

Thank you notes will be sent to individuals making contributions. A note will be sent to Javier Duran of Jewel-Osco for food donations.

Linda mentioned that Intel contributed $17,000 to purchase science kits. We should publicize Science Fair and find sources of support for Taylor science program.

We need to invite Ms. Sparlin in Health to be involved. She works with about 130 students.

Next organizational meeting is scheduled for Tuesday, January 7th at 7:30 p.m.

Mentoring workshop may possibly be held on the 3rd Thursday in January from 3:15 to 6:15 p.m.

TAYLOR SCIENCE FAIR MEETING January 7, 1992

Minutes taken by Irene Lueckenhoff

Individuals present:

Elizabeth Cochran	Chuck Easterling
Jan Lewis	Irene Lueckenhoff
Joyce Sitton	Pauline Gutierrez
Linda Banker	Col. John Miller
Dave Ring	

Science Fair - General Information:

Science Fair judging will be held on Feb. 19th and 20th. Project take down will be on Feb. 21st.

Col. Miller will find more judges for the Science Fair.

Dave Ring handed out a list of Science Fair judges already enlisted.

Protocal deadline is January 5th. Students may direct questions to Taylor Science Teacher David Thurlough.

We need to find a Taylor teacher as a point of contact to develop a Science Fair Steering Committee for next year.

Science Fair Judging:

A training session for judges will be held on Feb. 13th at 7:00 p.m.

Procedures will be reviewed with judges just prior to project judging.

John Hockert printed the Science Fair Judging Guide. It was patterned from the National Guide. When finished, it will be in booklet form.

We officially have 15 spots at Regionals. We can send more if we feel other projects have merit.

We have 22 display boards still available.

Science Project Interviews:

Dave Ring raised the questions of how, when and how many students should we interview? Do we interview only finalists?

Jan Lewis thought we should interview students who may potentially have an excellent project.

Dave Menicucci suggested that we do a preliminary adding up of points and interview the top 30%.

The suggestion was made that we judge on the first evening and interview on the second evening. A team of 2 or 3 judges might interview each student. Perhaps some judges could come around 2:30 p.m. to interview students unable to be present later.

Mentoring Workshop:

A Mentoring Workshop is scheduled for January 16th.

Chuck Easterling commented that attendance would be higher if done during the school day.

Jan Lewis suggested that we ask for use of the library and students could possibly come during their science period.

It was determined that another after school session was most workable.

Jan suggested that the purpose of this workshop should be to give support, direction and to answer questions. We could screen students and talk about their problems.

Dave Ring volunteered to give an opening talk.He suggested that we then let students tell us what they are working on. We could have a panel of experts to answer questions related to different science categories.

Possible panel members include:
John Hockert - Physical SCience
Pauline Gutierrez & Elizabeth Cochran - Biological Science
Dan Irick & Dave Menicucci - Engineering

In the overall speech, Dave would explain the categories. It was suggested that each category be stationed at a seperate row of tables in the cafeteria.

We would also introduce the mentoring hot-line at the workshop.

We need to address the problem of motivation. Only 7 of 15 projects that qualified went on to State last year and the number one Regional project didn't go to State.

Mentoring Hot-line:

Dave Menicucci suggested that we might consider setting up a mentoring hot-line. This could be used as an alternative to the mentoring workshop and or to help students going to Regionals.

We would need someone to coordinate this mentoring system. It might be set-up with one to three points of contact. These contacts would then refer students to mentoring volunteers by project category. Calls to the point contacts could be limited to 6:00 to 9:00 p.m. Mentors could be called three specified days per week from 7:00 to 8:30 p.m.

It was suggested that Ron Pate might be willing to set up Mentoring Hot-line.

Next meeting is scheduled for Thursday, January 30th.

TAYLOR SCIENCE FAIR MEETING January 30, 1992

Minutes taken by Irene Lueckenhoff

Individuals present:

Chuck Easterling	Col. John Miller
Irene Lueckenhoff	Principal Gene Johnson
Dave Menicucci	Pauline Gutierrez
David Thurlo	Don Mulder
Becky Pate	Jan Lewis
Sara Pittman	Bob Pittman

Science Fair Logistics:

Approximately 60 display boards have been sold. Jan has ordered 36 more boards and 50 title sheets.

A total of 225 participant certificates and 18 medals have been ordered from Superior Box Co. The order has arrived.

Taylor School has covered the cost of the ribbons.

Jan commented that we need to announce that boards are still available. Mr. Mulder commented that similar boards may be available at Biz-Mart for $2.50.

David Thurlo volunteered to design participant ribbons.

Jan has set up rental of 50, 8 ft., banquet tables from Garcia Tent Company. The cost of $637.50 was covered by Taylor School.

David Thurlo will look for 10-20 more tables at school to be available if needed.

Current survey of number of project entries is over 400. Surveys will continue to get more accurate estimate.

Pauline inquired about the project set-up arrangements. It was decided that students may bring in projects anytime after 7:00 a.m. Jan and Becky will be available to help.

It was suggested that we ask if tables could be brought early or the night before. If so, we will need a key as there will not be anyone at Taylor to open due to the holiday.

Dan Irick suggested that we xerox certificates. Dave Ring recommended Carol Fogle at Kinko's, Ph. 899-1865. Anna King, Eva Lee Taylor and Tammy Lodge's husband do calligraphy and may be willing to write in names on that day. Taylor school has an embosser.

Science Fair - General Information:

Becky Pate reported that Ron is out-of-town and not available as yet to set-up mentoring. Dave Menicucci asked if Ron might handle Regional mentoring also.

Date set for Regional Science Fair is March 20th. Set-up is the evening of March 19th.

Dave Ring was curious as to how many students make changes in their projects before going to Regionals. Dave Menicucci said that successful students take the comments of the judges and make apprpriate changes. Some students just continue their experiments. Protocal cannot be changed.

The question was asked regarding how many spots we had at Regionals. Dave Ring commented that Randi Buck would make space for as many as 15 extra projects judges considered worthy.

Dave Menicucci recommended that we verify the number of allocated spots.

Science Fair Committee has spent $400.26 thus far.

Col. Miller has written a letter to back $100 out of Taylor School account.

Jan suggested that we try to leave some seed money for next year.

It was proposed that we meet again on the evening of Feb. 13th, prior to the Judging Workshop. This would be a final report session. Some work will be done over the phone.

Taylor PAG has agreed to take over Science Fair account.

Pauline inquired as to when a letter of thanks should be given to judges. Dave Menicucci suggested that we mail them since many could be sent through the Sandia internal mail.

Thank you notes should be sent to Col. Miller's Kiwanis Club, Sandi Rhinehart and Bob Clark.

Science Fair Judging:

Dave Ring has recruited 19 judges. David Thurlo has 16 faculty volunteers and 5 individuals from Honeywell.

Col. Miller has recruited 7 Kiwanis members. Some individuals may have conflicts. He will have a confirmed list by next week.

A training session for judges will be held on Feb. 13th at 7:00 p.m.

Training session will be directed by Ron Grudotti and not Bob Clark.

Jan suggested refreshments for the training session.

Judging guides will be in judges' hands by next week.

Preliminary judging will be Tues., Feb. 18th during the day, using the rating sheet. From 4:00 to 8:00 p.m., the Kiwanis judges, Sandian judges, Dave Ring, David Thurlo and other judges will total up numbers to determine the top 40 projects.

A note will be sent out to students to let them and their families know that they may be asked to come back to school for an interview on Wednes., after 4:00 p.m. Those students who cannot will be interviewed earlier.

The judge doing the initial rating of a project will not do the second round interview for that project.

Dave Ring recommended putting project number on the top of the scoring sheet and cutting off the bottom comments to return to students.

Dave Ring would like to have projects displayed by category for the second round judging.

David Thurlo mentioned that each student will have a general entry form. Each project will be numbered. We will have an apple computer there for scoring and entering information on each student.

Grant Information:

Anna King, Coordinator of Special Education at Taylor, requested a letter of support from the Science Fair Committee for a grant which could result in 12 computers for 7th and 8th grade science classes at Taylor. Committee consented to write letter of support.

TAYLOR SCIENCE FAIR MEETING Feb. 13, 1992

Minutes taken by Irene Lueckenhoff

Individuals present:

Dave Ring	Elizabeth Cochran
Dan Irick	Pauline Gutierrez
Jan Lewis	Dave Menicucci
Bobbie Solis	Irene Lueckenhoff
Becky Pate	Ron Guidotti
Grant Bloom	Col. John Miller
David Thurlo	Mini Tafoya

Science Fair - General Information:

We have 304 project entries.

Science Fair Logistics:

On Monday at 5:00 p.m., 50 tables will arrive. Mr. Johnson, Taylor Principal, would like new bleachers down. We can move them up as needed. Some projects can be set up then.

Tables from within the school will be placed in the gym on Tuesday.

David Thurlo, Jan Lewis and other teachers volunteered to set up projects at 6:45 p.m. on Tuesday.

After Tuesday night judging, parents of selected students will be called to inform them of interviewing procedures.

Dave Ring has 4 clipboards. Joyce Sitton will bring 8 more.

Pauline Gutierrez will take care of sending out thank you letters. Letters for individuals from Sandia Labs will be sent through internal mail. David Thurlo will get letters to involved Teachers from Taylor.

Final List of Science Fair Needs:

We need volunteers to set up and serve food. Jan, Irene and Becky will assist on Tuesday. Elizabeth, Mini and Becky will help on Wednesday.

Elizabeth needs to know categories for banners.

Standards are needed to display categories.

Dave Ring requested enough judging forms for every project.

TAYLOR MIDDLE SCHOOL

Copies of SFVSC Correspondence and Promotional Materials

PROMOTIONAL JINGLES

MON.

BRING YOUR FOLKS AND START OUT RIGHT,
AT TAYLOR SCHOOL ON THURSDAY NIGHT.
A WORKSHOP FOR THE SCIENCE FAIR,
DROP ON IN WE'LL, SEE YOU THERE!

TUES.

PARENTS AND STUDENTS THAT'S THE SCHEME,
AT TAYLOR'S WORKSHOP WE'RE A TEAM.
WE WILL HELP TO GET YOU THERE,
YOU'LL MAKE IT BIG AT THE SCIENCE FAIR!

WED.

EXTRA CREDIT'S WHAT YOU'LL GET,
REMIND YOUR PARENTS AND YOU'RE ALL SET;
TO GET TO WORK FOR THE SCIENCE FAIR.
BRING YOUR IDEAS, WE'LL SEE YOU THERE!

THURS.

PICK A PROJECT AND FIND OUT HOW,
FOR SCIENCE FAIR THE WORK STARTS NOW!

SCIENCE FAIR WORKSHOP IN THE CAFETERIA THURS. DEC. 12
PARENTS AND STUDENTS CAN DROP IN AND LEAVE AT ANYTIME
DURING THE WORKSHOP HOURS OF 3:15 TO 6:15 PM.

ALBUQUERQUE PUBLIC SCHOOLS
TAYLOR MIDDLE SCHOOL
8200 GUADALUPE, N.W.
ALBUQUERQUE, NEW MEXICO 87114

December 3, 1991

Youth Committee
Northwest Albuquerque Kiwanis Club
Dan Irick
218 Ranchitos
Corrales, New Mexico 87048

Dear Dan:

Taylor Middle School has a group of active parents that are interested in making science and engineering more appealing to our students. They have undertaken a project to make this years Science Fair a more meaningful event and are working towards that goal.

One of the things they will be providing the students is an opportunity to come to a workshop, which will be held after school, to learn more about Science Fair and to help them have the best projects they can. These workshops will have expert adult consultants who will be available for the students and their parents to talk with. In addition, handouts and refreshments will be provided.

We are aware of the fine support the NW Albuquerque Kiwanis Club has given to the Regional Science Fair. We would like to ask for your help in this local project. We will need people to help with various parts of the Taylor Science Fair and would ask your club to participate if possible. In addition, we asking your club for a donation to help offset the cost of printing materials and for awards. If you could provide a $100 donation, or whatever you feel you can, this project would have a great chance of achieving its goal, which is to interest more students in the exciting world of science and engineering.

COPIES OF NOTICES OF SCIENCE FAIR EVENTS

Science Fair news for staff:

Students representing Taylor at the Regional Science Fair at UNM on March 19-21 are:

6th Grade: Andreas Garcia, Jonathon Ring, Jill Peterson, Joel Bristol, Kyndra Abeyta, Rebekah Lippis, Eric Pate, Anna Stryker, Lisa Donald, Jeremiah Phillips, Jennifer Webb, Kristina Guist, and Louie Tafoya.

7th Grade: Katherine Brown

8th Grade: Jesse Johnson, Mitzi Brockman, Andrew Hockert, Elyssa Jaeger, Gordon Nelson

Alternates will be Brian Haverly 6th, Katie Easterling 7th, and Kim Krause 6th.

Tonight is an <u>open house</u> and awards ceremony for the science fair. Everyone is invited to attend and view the projects, and to see those students representing Taylor receive their ribbons. Tonight's open house will be from 7 to 8 pm.

Student visits will be scheduled through the science classes on <u>FRIDAY</u>. Special Education teachers please see David Thurlo to arrange times for your students to visit. It is suggested that classes coming to the fair have assignments related to their visit.

Students listed above will need their teacher's permission to remain with their projects Friday to answer questions and protect their work from idle hands. All missed work must be made up.

<u>All students with projects must remove their projects from the gym</u> beginning at 2:40 Friday. If for some reason a teacher doesn't want to release a student, please have the student designate someone else to remove the project at that time.

Thanks for your continued cooperation and support of the science fair.

--- REMINDER --- REMINDER --- REMINDER ---

The Taylor Middle School SCIENCE FAIR WORKSHOP will take place on Thursday, December 12, 1991 in the school cafeteria from 3:15 to 6:15pm.

Valuable information and handouts will be available to help your and your child/children prepare an outstanding project.

Science Fair backboards will also be available for purchase for $6.50 each. (Price reductions may be available for disadvantaged families. Contact: Jan Lewis for details at 898-7419.

--- REMINDER --- REMINDER --- REMINDER ---

The Taylor Middle School SCIENCE FAIR MENTOR WORKSHOP will take place on Thursday, January 16, 1991 in the school cafeteria from 3:15 to 5:30pm.

Technical professionals will be on hand to answer questions about student's projects and to suggest how the student's project can be improved.

TAYLOR MIDDLE SCHOOL

Copies of SFVSC Handout Materials from the Science Fair Parent/Student Orientation Workshop

(Note: Taylor also used materials supplied by Sandia in Appendix B)

New Mexico Junior Academy of Science
Regional and State Paper Competition Rules

1. Before papers will be accepted for presentation, the presenting student must be a member of the N.M.J.A.S. If not paid yet during this current school year, the membership fee of $3.00 must accompany the completed **REGIONAL** entry form.

2. Although the project need not be entered in a science fair, the paper MUST reflect **actual science experimentation by the student, or theoretical work of the student in an area of pure mathematics or physics, or the development of a scientific computer model.** Papers that are simply literary 'search' papers are not acceptable for competition.

3. The maximum length of the paper is 1500 words, not including appendixes.

4. The paper MUST be typed, double-spaced, and on one side of the paper only.

5. The following information must appear on the title page: title, name of writer, age, school grade, school, school address, school telephone number, home address, home telephone number, and name and signature of teacher or sponsor who endorses the paper. Repeat the last name of writer and title of the paper at the top of each page.

6. An entry form MUST be completed and submitted with the paper.

7. Three copies of the paper (including abstracts), one for each judge, along with the completed entry form must be mailed to the Regional Director by the deadline on the entry form.

8. Each paper should be clipped together, but not bound. Judges will judge the paper on its merits before the presentation, as well as the presentation itself.

9. The author should, without fail keep a copy of the paper as protection against loss. However, all copies of the paper will be returned to the student at the close of competition.

10. Presentation time limits will be strictly enforced. Each presenter has 10 minutes maximum for the presentation and 5 minutes after the presentation for judges' questions.

11. It is strongly recommended that audio-visual aids be employed in the presentation. Audio-visual aids are limited to 35 mm slides and/or overhead transparencies. **NO OTHER AUDIO-VISUAL AIDS, such as charts, hand-held demonstrations, chemicals, etc., are allowed.** A carousel slide projector and an overhead projector will be provided at regional and state competitions.

12. Copies of the current judging forms will be sent to sponsors who request information, so there will be no confusion between judges' expectations and presenters' preparations.

13. Each regional director is responsible for ensuring that NO MORE than two entries for each division, junior and senior, are sent to state competition.

14. It may be necessary because of time constraints, if there are more that eight entries in one division, for the judges to eliminate some entries on the basis of the written paper. Those eliminated will be informed as soon as possible.

15. Senior division includes students in grades 9, 10, 11, and 12. Junior division includes students in grades 6, 7, and 8.

16. Order of presentation is determined by random drawing. Once the order of presentation is determined, **NO CHANGES WILL BE MADE,** except for absences. Failure to appear for competition on time and ready to present will result in disqualification.

17. A student may secure help in structuring, proofreading, and typing the paper. However, any and all assistance MUST be noted in the acknowledgments.

18. Multiple authorship of papers is not allowed, nor may a presenter have assistance during the presentation, other than technical assistance with projectors.

19. In order to promote professional courtesy, and to minimize distractions, all presenters are required to stay for the entire paper session. You should arrive at least 15 minutes before it begins, and stay until the last paper has been presented. Coming or going during the session may cause you to be disqualified.

SPONSORS: *IT IS YOUR RESPONSIBILITY TO SEE THAT THE RULES ARE FOLLOWED. USE THIS SHEET AS A CHECKLIST, SO THAT THERE ARE NO OMISSIONS OR MISUNDERSTANDINGS. SIGN THE TITLE PAGE, AFTER YOU HAVE CHECKED THIS LIST CAREFULLY.* If you have questions, feel free to contact your regional director or the state director. But please . . . do so well before the date of competition.

Rules revised: September 1989

New Mexico Junior Academy of Science
Regional and State Paper Competition

RECOMMENDED COMPONENTS FOR TECHNICAL PAPERS FOR JUNIOR ACADEMY OF SCIENCE PAPER SESSION

Technical papers are somewhat different from other literary papers in their composition. Characteristics which distinguish science research papers from other types of papers are: the abstract; the table of contents; the captioned text; and often, author-date reference citations.

There are basically two types of science research papers: reviews of the literature, and reports of empirical studies. For purposes of the Junior Academy of Science Paper competition, your paper will be a report of your empirical study, with a short literature review included in it.

You must do a science investigation, or a project in theoretical mathematics or physics, or a scientific computer model. Keep careful records of everything you do, and all your results, then write your paper. It should contain the following components:

1. Title page — containing your title, your name, your age, your school grade, your school, school address and school phone number; your home address and home phone number; and the name and signature of your teacher-sponsor.
2. Abstract — a brief statement of the contents of your paper with regard to the work that you did. In one or two paragraphs, define your problem, describe your methodology, summarize your results, and state your principal conclusions.
3. Table of contents — Use captions from your text as entries in the table of contents, and list the beginning page of each.
4. Acknowledgments — Thank people who have helped you in any way.
5. Text — consisting of the following:
   - Introduction
   - Review of the literature (cite references)
   - Materials and Methods of Experiment or Mathematical Assumptions and/or Proofs
   - Results
   - Conclusions or Discussion
6. Summary — of the whole paper
7. Glossary — if needed
8. Appendix(es) — if needed
9. References

TAYLOR MIDDLE SCHOOL

Copies of SFVSC Materials Relating to Judging

GUIDELINES FOR JUDGE INTERVIEWS

The interview is perhaps the most educational aspect of the science fair. Purposes of the interview are: to stimulate the student's thinking; to suggest means of improving his work (and working habits); to point out mistakes; to open up a feedback channel from the judge (who is most likely a specialist in a given field) to the advising teacher (and thus indirectly to contribute to an improvement of science education). It may also be an illuminating experience for the judge himself.

Typical questions for judges:

How well does the student know and understand the basic principles behind his project?

Where, or from whom, did he get the idea for his exhibit?

Does he understand the significance of his conclusions?

Do the conclusions follow from his work?

In undertaking the project, did he have a clear purpose in mind, and one that was within his means?

How much time did he spend on the project, and when did he start it?

Does he understand how his apparatus works?

How much help did he have in building it? (Remember, getting help is <u>not</u> a negative point)

What was the source and cost of parts?

Did he write his report himself?

Did he collect and study supplementary references?

Note: Work with the student to make sure you understand what the student really knows about his/her project.

If answers to questions like these are satisfactory, the student has succeeded.

Project # _____

TAYLOR MIDDLE SCHOOL SCIENCE FAIR
JUDGES' RATING SHEET

Project Title _____

Numerical Ratings

Category / Rating	Unsatis-factory (2)	Poor (4)	Average (6)	Good (8)	Excellent (10)	Weighting Factor	Total Score
Creative Ability	____	____	____	____	____	x 3 =	____
Scientific Thought/ Engineering Goals	____	____	____	____	____	x 3 =	____
Thoroughness	____	____	____	____	____	x 1.5 =	____
Clarity and Dramatic Value	____	____	____	____	____	x 1.5 =	____
Technical Skill	____	____	____	____	____	x 1.0 =	____
Total Score							____

==========

Comments

Creative Ability _____
_____
_____

Scientific Thought / Engineering Goals _____
_____
_____

Thoroughness _____
_____
_____

Clarity and Dramatic Value _____
_____
_____

Technical Skill _____
_____
_____

Judging Team _____
_____

Project # _____

TAYLOR MIDDLE SCHOOL SCIENCE FAIR — JUDGES' ENLISTMENT

Times Needed: **7 pm Thursday, February 13 — Training Session**
___ pm (exact hours TBD) Tuesday, February 18
___ pm (exact hours TBD) Wednesday, February 19

NAME	BACKGROUND	EXPERIENCED? (YES/NO)	TELEPHONE NUMBER
Grant Bloom	Sandia Labs		
* Bob Clark	Sandia Labs	Yes	844-6332
Rudy Jungst	Sandia Labs	Yes	844-1103
Garth Corey	Sandia Labs	Yes	845-4596
Wendy Cieslak	Sandia Labs	Yes	844-8633
Paul Butler	Sandia Labs	Yes	844-7874
Ron Guidotti	Sandia Labs	Yes	846-1678
Troy Cowan	DoD		255-6101
Patty Mansker	Sandia Labs	No	844-9113
Bill Schaedla	Sandia Labs	No	845-8528
John Hockert	Physicist	No	881-9228
Al Jacobson	Sandia labs	Yes	844-8462
Dave Tapscott	Sandia Labs		844-8017

February 4, 1992

MEMO TO: Prospective Taylor Middle School Science Fair Judges

FROM: Dave Ring, Member, TMS Science Fair Committee

SUBJECT: JUDGING MANUAL, SCORING SHEETS, DATES, TIMES, ETC.

This memo is intended for all persons who have agreed to serve, following recruitment by myself or others, as judges at the Taylor Middle School Science Fair, Feb. 18-19, 1992. IF YOU RECEIVE THIS NOTE AND YOUR PLANS HAVE CHANGED IN THIS REGARD, PLEASE CALL ME A.S.A.P. AT 898-1327 TO SO INDICATE.

The judging manual and sample scoring sheet you are receiving with this note are, I hope, largely self-explanatory. Please be reminded that, for those who need and/or wish to receive training as science fair judges, this training session will be led by Mr. Ron Guidotti of Sandia Laboratories, an experienced NM State Science Fair judge, at Taylor Middle School, in the Library, on Thursday evening, February 13th, beginning at 7:00 PM.

There will be three "rounds" of science project judging during Feb. 18-19 at Taylor Middle School. The first will be held during the school day on Tuesday, Feb. 18, and will be conducted by Taylor faculty and Honeywell Corp. personnel recruited by Mr. David Thurlo. The second will be held Tuesday afternoon-evening, Feb. 18, from 4 to 8 PM, conducted by Sandia Labs personnel and other individuals recruited by myself and by Kiwanis Club members recruited by Col. Miller. All judges will use the same scoring sheet, and will do numeric scoring with no students present. We will try to form the judges into "teams" of 3 or 4 and ask each team to evaluate 15 to 20 projects. A snack supper will be served to judges ("on the run") sometime during the afternoon-evening session ("snack supper" also available on Wed.)

After Tuesday's two "qualifying" rounds, Mr. Thurlo and myself will add up the numeric scores and thereby determine the "top 40-plus" projects. Those students will be contacted and asked to be available, with their projects, for interviews on Wednesday, Feb. 19th, during the 4 to 8 PM time period. The afternoon-evening judges from the prior day, i. e., those from Sandia, Kiwanis, and a few additional individuals, will conduct a third round of judging, including interviews, of these students and their projects. Of course, judging "teams" will be switched, so that a team which evaluated a given project on Tuesday will not do that same project on Wednesday. The same scoring sheets will be used for this "final" round of judging, and Mr. Thurlo and myself will use these scores, in combination with the prior two scores, to determine the "top 18" projects, and a few alternates, that will be invited to compete at the regional level. (It may be that one or two students who qualify for the Wednesday round of judging cannot stay after school on Wednesday for interviews. If so, Mr. Thurlo will see to it that 3 or 4 Taylor faculty members conduct a team interview with those students during the school day in order to produce a third-round score.)

If anyone has questions, the best opportunity to raise such will be at the training session on Thursday evening, Feb. 13th. If you can't make that session and have an important question, please call me. I want to thank you, in advance, for your willingness to serve Taylor Middle School in this way.

--Dave Ring

JUDGING GUIDE

TAYLOR MIDDLE SCHOOL SCIENCE FAIR

Albuquerque, New Mexico

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Introduction

The success or failure of any science fair depends to a large extent upon the quality of the judging. Therefore, it is vitally important for each judge to understand the duties and obligations of judging and the standards by which Taylor Middle School science fair projects are to be judged. This guide outlines these duties, obligations, and standards. Your first duty as a science fair judge is to read this guide carefully in preparation for the judging. If you have any questions or concerns about any aspect of these guidelines, it is your duty to raise question or concern at the orientation for judges prior to the judging session.

The Taylor Middle School Science Fair is a competition based upon the quality of projects done by the students, the results of which are presented through exhibits at the fair. The objectives of the Taylor Middle School Science Fair are fourfold: (1) to stimulate an active interest in science and engineering among the students; (2) to provide students with a non-traditional educational experience through the preparation, exhibition, and evaluation of their projects; (3) to give public recognition to the students for work that they have done; and (4) to provide a equitable method of selecting student science fair projects to represent Taylor Middle School at the regional and state science fairs. As a science fair judge, your efforts make a significant contribution to the achievement of each of these objectives of our science fair. The purpose of this guide is to assist you in helping the Taylor Middle School Science Fair achieve its objectives.

The subsequent sections of this guide describe the general judging process, the judging criteria, and the

recording of rating information. Details concerning the layout of this year's science fair, judging schedules, and other administrative information are provided in a separate document.

General Judging Process

The general judging process consists of: (1) judges' orientation session, (2) prejudging activities; (3) survey of the entire science fair; (4) survey of the exhibits to be judged by your team; (5) examination of the exhibits to be judged by your team; and (6) interviews. Each of these parts of the judging process is described below.

Judges' orientation session: This session includes a review of this judging guide, a presentation of the layout of the exhibits and any judges' areas, a trial workshop in which several example exhibits are judged using this guide, and an opportunity for the judges to ask questions and to resolve any concerns related to the judging process. The purpose of this orientation session is to help ensure that the judging of exhibits is consistent and fair. In addition to reminding the judges of the process and criteria to be used for judging, this orientation is intended to help the judges to interpret and to apply the judging criteria in a consistent manner. All judges must attend the orientation session in order to be permitted to serve as science fair judges.

Prejudging activities: These activities include the assignment of judges to teams, the determination of which exhibits each team will judge, and any other administrative activities that must be accomplished prior to the start of the judging. The judging of exhibits is

conducted by teams of at least two judges, depending upon the availability of judges and the number of exhibits. Judges are grouped into these teams based upon their technical backgrounds and interests and upon the types of exhibits to be judged. Because it is physically impossible for each judging team to evaluate all of the projects, teams are assigned to evaluate specific projects. These assignments are made based upon the technical background and interests of the team members, with appropriate adjustments to equalize the workloads of the judging teams. The objective of the assignments of individuals to judging teams and of the selection of the exhibits to be judged by each team is to ensure that at least one team member has a technical background in the areas relevant to each project judged by the team. During these activities, judges will also be informed of which, if any, students the team will be interviewing as a part of the judging activities.

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Survey of the entire fair: (No students present at exhibits.) The purpose of this survey is to gain an understanding of the general trend of the exhibits and to make an estimate of the quality of the projects/exhibits in those areas other than those that you are judging. There are a large number of exhibits so judges should plan their time carefully so that they will be able to examine a reasonable number of the exhibits in the areas judged by others. It is vital that each judge have an understanding of the overall caliber of the projects so that the judging teams can make a consistent evaluation of the quality of each project in the context of the entire science fair.

Survey of exhibits to be judged by your team: (No students present at exhibits.) The purpose of this survey is to make a general estimate of the quality of the projects/exhibits that your team will be judging so that you

will have a frame of reference to decide what is good quality and what is lesser quality. Remember that you are judging on a relative basis rather than an absolute basis. You are comparing projects with each other and not with the work of high school or college students or professional scientists. It is also important to establish your final standards of quality during this survey to ensure that the projects that you evaluate first are judged on the same basis as those that you evaluate later.

Examination of exhibits to be judged by your team: (No students present at exhibits.) The purpose of this examination is to make a detailed evaluation of the overall quality of the project/exhibit against the judging standards. During this time you should: (1) study the exhibit; (2) discuss your conclusions about its quality with the other member(s) of your judging team; (3) make notes on the types of questions that you want to ask during the interview; and (4) assign a quality rating to the project against each of the judging criteria. If your team is assigned to conduct an interview as aprt of the judging process, then this quality rating is a preliminary rating and should be revised based upon the interview. If your team will not be conducting an interview then this is the final rating to be assigned to the project. (See te guide section entitled, *Recording of Rating Information*, for instructions on completing your judge's rating sheet.)

You will be assisted by the fact that the exhibits are substantially self-explanatory, and that there will also be an abstract that describes the project. However, during this stage of the judging you should be alert to the possibility that what appears to be a poor quality exhibit may be a poor presentation of a high quality project. It is certainly appropriate to down grade such exhibits in the area of presentation. Nevertheless, the judge should

make an effort to look beyond the exhibit (making particular use of the interview, if one is to be conducted) to try ascertain the true quality of the project.

This period also provides an opportunity for a judging team that does not feel that they have, in aggregate, sufficient technical background to evaluate a specific project, to bring this concern to the attention of the Science Fair Director. Some projects may require interdisciplinary judging (e.g., a botany project that uses a lot of mathematics). If you feel that a team with experience in another technical discipline also needs to judge one of the projects assigned to your team, you should notify the Science Fair Director.

Depending upon the availability of judges and the number of science fair projects, it may not be possible to have the judging of each project include an interview or to have all judging teams conduct interviews. If your judging team will not be conducting interviews, skip ahead to the judging criteria.

Interviews: One purpose of the interview is to determine how well the student understands his or her project and to evaluate the quality of the project from a perspective independent of the quality of its presentation in the exhibit. During this time, you should determine the final quality rating that you believe should be assigned to the project in each of the judging criteria.

However, the interview also provides you with an opportunity to stimulate students' interest in science and engineering. In many cases you may be one of the few professional scientists or engineers that the student has ever met. He or she may reach conclusions about the desirability of working in a science or engineering

profession based upon this interview with you. Therefore, the interview is important not only to the judging process but also to the achievement of the overall science fair objectives.

Each interview should last for 10 to 15 minutes. Judges are encouraged to talk to each student as much as possible, but with one limitation -- it should not be at the expense of other students. A judge should ask the questions necessary for the purpose of judging, but should not take spend time just talking if it means that there will not be sufficient time to interview other students.

No student whom you have been assigned to interview should be passed over regardless of what you think of his or her exhibit. Judging is an educational process as well as a selection process and so a student should be given as much time as possible. Students will appreciate your suggestions on how to improve their research. In addition to suggesting improvements, it is important that you let the student know what he or she has done well in preparing the project. Remember that each exhibit, no matter what you think of its quality, represents a commendable effort on the student's part. You try to find at least one thing good to say to each student about his or her work.

Remember, do not fill out your judges' rating sheet, or discuss the assignment of ratings with your team, in front of the students. All rating sheets must be turned in to the Science Fair Director prior to leaving.

When interviewing, judges should remember that the Taylor Middle school Science Fair is not only a competition -- it is also an educational and a motivational experience. Most students say that they enjoy talking to

the judges, and that in many cases, it is the high point of their experience in the Science Fair. As a general rule the judge represents professional authority to the student being evaluated. Therefore, it is imperative that judges conduct themselves in an appropriate, professional manner. In all instances judges should ask questions, offer suggestions, or proved constructive criticism in a way that encourages continued effort. Judges must never tear down, treat lightly, or display boredom toward projects that they personally consider to be unimportant. Always recognize that the student has made an effort to prepare and present the project and that the project has been judged to merit an interview.

Judging Criteria

What Are We Judging?

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We are judging the following:

- The quality of the work done on a project in science, engineering, or mathematics by a middle school student, and how well that student understands the project and the area in which he or she has been working. The quality of the physical display (exhibit) is of secondary importance.

- A project that involves some thought and effort over and above library research or gadgeteering.

- A middle school student's work -- not that of a high school or college student or a professional. Sometimes judges overreact to middle school students, either giving them far more credit than they deserve or acting as though the work done

by the student is worthless because it is not top quality original research.

A project as compared with other projects at the Taylor Middle School Science Fair, and not with projects seen elsewhere under other circumstances.

Criteria

Projects are judged on the following basis:

Creative Ability	30 points
Scientific Thought/Engineering Goals	30 points
Thoroughness	15 points
Clarity and Dramatic Value	15 points
Technical Skill	10 points

Creative Ability (30 points)

1. Does the project show creative ability and originality in:
   - the question asked?
   - the approach to solving the problem?
   - the analysis of data?
   - the interpretation of data?
   - the use of equipment?
   - the construction or design of new equipment?

Obviously no project will be creative and original in all of these aspects and, in addition, it is necessary to keep in mind that these are middle school students' projects. Thus, it necessary to determine whether the project is creative for a middle school student as opposed to what would be expected from a professional scientist or engineer.

A student should not be penalized for asking for and getting help from others (all professionals receive help in some way). However, credit for creative ability and originality should be based upon the student's contribution rather than upon the help given by others. For example, did the student get an idea for the project from a textbook suggestion for research or did he or she develop the idea as a result of independent reading or other work? If the student developed the idea alone, it should be considered more creative. Making this type of determination can be difficult. There have been projects that contained elements that judges thought were original, but that actually came from textbooks or laboratory materials in school curricula, with which the judges were unfamiliar. Judges should keep this possibility in mind and use the interview portion of the judging to help determine the actual level of creativity demonstrated.

Another source of possible help that needs to be evaluated is the student's teachers, parents, or other adult mentors. The approach that a student uses to solve a problem amy appear to be very original. However, this original approach may have come from suggestions made by a teacher, parent, or other adult. Thus the idea is original but it is not totally the student's. Such an idea must be compared with a less sophisticated approach that came completely from the student's own work or

thinking. Obviously, the latter should be considered more creative.

2. Collections cannot be considered to be creative unless they are used to support an investigation or help to answer a question in some original way. Likewise, construction of equipment from a commercially available kit cannot be considered to be creative unless some unusual approach or design is employed.

3. For engineering, a clear distinction should be made between gadgeteering and a genuine contribution. A "Rube Goldberg" device may be ingenious but if is not really: (1) the most efficient way to solve the problem; (2) acceptable to potential users; or (3) reliable in its functioning, then it cannot really be considered to be a valuable creative contribution.

As a general rule, the scoring in this area should be "normalized" so that a project of average quality for the science fair receives a score of 18 points. (See the section of this guide entitled, "Recording of Rating Information.)

Scientific Thought/Engineering Goals (30 Points)

Scientific Thought:

1. Is the problem stated clearly and unambiguously?

2. Was the scope of the problem limited to a sufficient extent that it could be solved within the

context of a science fair project? One of the characteristics of good scientists is the ability to identify important problems that can be solved. Merely working on a difficult problem without making progress in solving it does not make much of a contribution. On the other hand, neither does solving a very simple problem.

3. Was there a procedural plan to obtain a solution to the problem?

4. Have all of the variables been clearly recognized, defined, and controlled, if such controls were required to solve the problem?

5. If controls were necessary, was this need recognized and were the controls correctly used?

6. Were adequate data collected to support the conclusion?

7. Have the limitations of the data been recognized?

8. Overall, does the project demonstrate an understanding of the scientific method?

9. Does the student understand the relationship of this project to other associated research?

10. Does the student have an idea of what further research is indicated?

11. Did the student cite scientific literature, or cite only popular literature (e.g., local newspaper, Readers Digest, or magazines)?

Again, it is important to recognize that the participants in the science fair are middle school students and that both the scientific method and the techniques used by professional scientists and engineers are likely to be new to them. It is also important to note once more that the student may have received assistance and that it is an important part of the judging to estimate the extent of this assistance and to evaluate the contribution that it made to the project.

Engineering Goals:

1. Does the project have a clear objective?

2. Is this objective relevant to a practical problem? That is, does it meet, or help meet, the needs of a potential user?

3. Is the solution

   - workable? Unworkable solutions may be interesting but are of no value in practice.

   - acceptable to the potential user? Solutions that will be rejected or ignored are of no practical value?

   - economically feasible? A solution that is so expensive that it cannot be used is of no practical value?

4. Can the solution be successfully employed in the design or construction of some useful end product?

5. Does the solution represent a significant improvement over previous alternative solutions?

6. Has the solution been tested to see whether it will actually perform under intended use conditions? (This will be difficult for many students, but it should have been considered. If no testing has been done, does the student have any idea how such testing could be practically accomplished?)

As a general rule, the scoring in the area of scientific thought/ engineering goals should be "normalized" so that a project of average quality for the science fair receives a score of 18 points. (See the section of this guide entitled, "Recording of Rating Information.)

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Thoroughness (15 Points)

1. Is the project complete within the scope of the purpose originally established?

2. How completely has the project covered the stated problem?

3. Are the conclusions based upon a single experiment or on several replications of the experiment?

4. If notes are appropriate for this type of project, how complete are they?

5. Is the student aware of other approaches or theories related to solving the stated problem?

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6. How much time was spent on the project?

7. Was the project well planned?

8. Has the student thoroughly reviewed and become familiar with the scientific or technical literature related to the project? Although citations are not considered to be as important in engineering as in science, the student should have made an effort to determine how problems similar to his or her problem are being, or have been, solved.

Again, it is important to recognize that the participants in the science fair are middle school students and will not have the familiarity with either the scientific and technical literature or the techniques used by professional scientists and engineers. It is also important to note once more that the student may have received assistance and that it is an important part of the judging to estimate the extent of this assistance and to evaluate the contribution that it made to the thoroughness of the project.

As a general rule, the scoring in this area should be "normalized" so that a project of average quality for the science fair receives a score of 9 points. (See the section of this guide entitled, "Recording of Rating Information.)

Clarity and Dramatic Value (15 Points)

1. How clearly is the student able to discuss the project? Can he or she explain its purpose, procedure, and conclusions in a clear and concise

manner? Discount superficial glibness but try to make allowance for the nervousness that may be natural in talking to an authority. Watch out for instances in which students have memorized speeches that they don't really understand.

2. Does the written and graphical material clearly and dramatically present the project? Remember that the student may have had help in preparing this material. Try to estimate the extent of this assistance and to evaluate the contribution that it made to the clarity and dramatic value of the exhibit.

3. Are the important phases of the project presented in an orderly manner?

4. How clear is the presentation of the data and the procedure employed to obtain them?

5. How clear is the presentation of results?

6. How well does the exhibit present itself?

7. Is the exhibit visually attractive? Does it draw and hold your interest?

8. Is the presentation made in forthright manner, without cute tricks or gadgets?

9. Was all of the work done by the student or was assistance obtained from parents, teachers, or others?

As a general rule, the scoring in the area of clarity and dramatic value should be "normalized" so that a

project of average quality for the science fair receives a score of 9 points. (See the section of this guide entitled, "Recording of Rating Information.)

Technical Skill (10 Points)

1. How high a level of technical skill was required to accomplish the project (e.g., laboratory skill, computational skill, observational skill, design skill)?

2. Does the student appear, based upon the interview, to know or have learned all of the skills required to accomplish the project?

3. Where was the project done? Home? School Laboratory? University or other laboratory facility? What assistance was received from parents, teachers, scientists, or engineers?

4. Was the project carried out under the supervision of an adult or did the student work largely on his or her own?

5. How was any specialized equipment obtained? Was it built independently by the student? Was it obtained on loan? Was it part of a laboratory in which the student worked?

As a general rule, the scoring in the area of clarity and dramatic value should be "normalized" so that a project of average quality for the science fair receives a score of 6 points. (See the section of this guide entitled, "Recording of Rating Information.)

Recording of Rating Information

Each judging team is to record their evaluation of each project on the "Taylor Middle School Science Fair Judge's Rating Sheet," copies of which will be provided. The rating sheet is divided into two sections by a dashed line. The upper section, upon which the numerical scores are recorded, will not be provided to the students. The lower section, upon which the judges' comments and suggestions are recorded will be provided to the students to help them do better in future projects. The instructions for completing the rating sheet are as follow:

Record the number and title of the project being rated, as the number and title appear on the exhibit in the blanks labeled, "project number" and "project title" on the upper and lower sections of the rating sheet.

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Record the numerical scores corresponding to the ratings in each of the judging categories in the portion of the upper section of the form labeled "numerical ratings." In order to record the numerical score for a particular category, rate the overall quality of the project in that category as: (1) unsatisfactory; (2) poor; (3) average; (4) good; or (5) excellent.

- If the project is unsatisfactory, record a 2 on the line in the "unsatisfactory" column in the row corresponding to the category that you are evaluating.

- If the project is poor, record a 4 on the line in the "poor" column in the row corresponding to the category that you are evaluating.

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- If the project is average, record a 6 on the line in the "average" column in the row corresponding to the category that you are evaluating.

- If the project is good, record an 8 on the line in the "good" column in the row corresponding to the category that you are evaluating.

- If the project is excellent, record a 10 on the line in the "excellent" column in the row corresponding to the category that you are evaluating.

If your team determines that the proper rating for a project is intermediate between two of the established ratings, record the average of the numbers corresponding to the two ratings on the line in the column corresponding to the higher rating. For example, if your team determines that a project is good to excellent in the area of creative ability, record a 9 in the line under the heading "excellent" on the row labeled "creative ability."

Compute the total score for a category by multiplying the number that you recorded in the column corresponding to the rating by the number in the weighting factor column and enter the result on the line in the total score column.

For example, if you rated a project as average in creative ability, then you would record a 6 in the "average" column in the "creative ability" row. The weighting factor for the "creative ability" row is 3. Therefore, you would multiply the 6 by 3 to get 18, which you would enter in the "total score" column in the "creative ability" row.

Compute the total score for the project by summing the entries in the "total score" column in all of the rows.

In addition to recording the numerical scores for each category, your team should also record, in the comments portion of the lower section of the form, a brief explanation of the bases for the numerical ratings. You may also include suggestions for further research or for other enhancement of the project in the comments section.

Finally, record your names in the blanks labeled "judging team" at the bottom of the upper and lower sections of the form.

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Appendix E:
Science Fair Resource and Organizational Materials Developed by St. Charles Borromeo School SFVSC

Example of Data Base Entry To Identify Volunteers for PTO E-3
Minutes of St. Charles Borromeo School SFVSC E-9
Handout Materials for Parent/Student Workshop E-23
- Selecting a Topic and Getting Organized E-25
- The Scientific and Engineering Methods E-39
- Presenting Your Project at the Science Fair E-45
- The Written Report or Scientific Paper E-49
- Judging at the Science Fair E-59

ST. CHARLES BORROMEO SCHOOL

Example of Data Base Entry
To Identify Volunteers for PTO

EXAMPLE OF DATA BASE ENTRY
TO IDENTIFY VOLUNTEERS FOR PTO

File: VOLUNTEERS.92
Report: Full Record Page 1
Selection: OTHER contains SC.FAIR

LAST NAME: JONSON
FIRST NAME: ANTHONY
MIDDLE NAME:
GRADE: 7 A
CHILD ST. NAME: 125 23RD ST. NW APT. A
CHILD CITY,STATE: ALBUQ., NM
CHILD ZIP: 87105
CHILD PHONE: 736-2454
BILL LAST NM: JOHNSON
BILL FIRST NM: GEORGE & KIM
TELEPHONE #: 827-8099 WORK
FATHER OCCUP.: UPHOLSTERY
MOTHER OCCUP.: BOOKKEEPER
1-TCHR SUPP.: SUPPLIES
2-EXTRA ACAD.: ACADEMIC COMPETITIONS
3-FUNDS: MAGANIZE, PUBLICITY
4-SCH/OFFICE.: TYPING, PTO COMMITTEES
5-AFTER SCH.:
6-OTHER: TOOLS, ACCOUNTING, SC.FAIR
HOURS WORKED:

PARENT PARTICIPATION FORM
1991 - 1992 SCHOOL YEAR

The parents of our students all work at a variety of jobs and each one has skills that can translate from the home or work place to the school. Making St. Charles a successful school requires the help of parents who can contribute primarily their time, or $25.00 worth of needed materials, or $25.00 in check or cash.

Please list your occupation below and check the lists given in which areas you could make a contribution. If you are unable to contribute the equivalent of at least 5 hours per year because of other commitments, there is a parent participation fee of $25.00. Your contributions will be recorded at the end of each month and families who have not completed the equivalent of at least 5 hours by the end of February (next year) will be billed for the participation fee.

Your support is very valuable to the school, so please consider where you can realistically help out. If you have other possibilities not listed, please write them in below. Thank you.

CHILD'S NAME _____ MOTHER'S NAME _____

Address _____ Occupation _____

City/State/Zip _____ FATHER'S NAME _____

Telephone _____ Occupation _____

I would be able to work with the following group/groups if called:

TEACHER SUPPORT

_____ Collecting/organizing classroom supplies
_____ Classroom aide
_____ Room Parent
_____ Teacher morale
_____

EXTRA ACADEMIC AREAS

_____ Science Fair
_____ Academic Competitions
_____ Invention Convention
_____ Computers in class

FUNDRAISING

_____ Magazine Drive
_____ Halloween Carnival
_____ Mayfest
_____ Publicity for Events
_____ Soliciting Supplies/Prizes
_____ Other Ideas

SCHOOL & OFFICE SUPPORT

_____ Typing/General Office
_____ Phones/Messages/Errands
_____ Playground Duty - Recess (A big need)
_____ Cafeteria Duty (A big need)
_____ Traffic--A.M. or P.M.
_____ Newsletters
_____ Other Home & School Committees

AFTER SCHOOL ACTIVITIES

_____ Drama/Dance
_____ Chorus/Music for Mass
_____ Math/Science Club
_____ Computer Club
_____ Chess Club
_____ Athletics
_____ Dances (6th, 7th, 8th)

OTHER AREAS IN WHICH YOU MIGHT HELP

_____

ARE THERE OTHER SKILLS AND ABILITIES YOU CAN PROVIDE?

_____ Plumbing _____ Electrical _____ Painting
_____ General Construction _____ Handy with Tools
_____ Access to Special Tools _____ Interior Decorating
_____ Surveying _____ Computers _____ Medical/Nursing
_____ Accounting _____ Engineering _____ Counseling

Access to reduced prices for Xeroxing or other supplies, please specify: _____

SUMMARY OF COMPLETED WORKSHOP EVALUATIONS

St. Charles Science Fair Workshop - December 3, 1991

1. 34 responses returned by parents prior to the workshop stating they would attend.

2. 56 families actually attended the workshop.

3. Number of children in the following grades who had a parent(s) attend:

   5th grade - 3
   6th grade - 28
   7th grade - 16
   8th grade - 14

4. 19 evaluation forms returned.

   3 - SOMEWHAT HELPFUL
   14 - VERY HELPFUL
   15 - INFORMATIVE
   9 - EASY TO UNDERSTAND
   12 - WELL PRESENTED
   1 - CONFUSING
   1 - INTERESTING, BUT NOT VERY USEFUL
   3 - OTHER
   7 - Comments

   "It might have been nice to have had a short presentation about the various aspects, i.e. topic selection, scientific or engineering method, presentations, written reports, etc., before going out to the tables. Perhaps that would have stimulated areas of questions that could have been explored more fully at the tables."

   "The presenters were very helpful."

   "Written materials were already gone by the time we got in at 4:30 p.m."

   "There were not enough handouts for all the students who were signed up to participate."

   "Have enough handouts for everyone."

   "You need to assure there are enough handouts for all participants to take home."

   "Needs to be for all grades 1st through 8th."

EVALUATION FORM

In hopes of making improvements, please evaluate the Science Fair Workshop.

I found the information to be (check as many as you feel are appropriate):

_____ Somewhat helpful

_____ Very helpful

_____ Informative

_____ Easy to understand

_____ Well presented

_____ Confusing

_____ Interesting, but not very useful

_____ Other

What additional information would have been helpful?

ST. CHARLES BORROMEO SCHOOL

Minutes of
St. Charles Borromeo School SFVSC

Minutes
St. Charles Science Fair Volunteer Action Committee Meeting
October 29, 1991

Introduction made by Mr. Price
Program overview and distribution of informational packet on program by David Menicucci of Sandia National Labs.

1. Presentation of the philosophy and role of DOE in the self-help program for science fairs
2. Presentation of factors that hinder parental involvement in their children's education
3. Presentation of why and how to motivate parents to assume a more active role
4. Presentation of how Sandia's Educational Outreach Program can be used to design and implement a model science fair. This program can help to organize all aspects of the science fair so that students, parents, teachers and administrators will benefit. Setting up guidelines, tasks and time tables will help in future science fairs also.
5. Sandia's Educational Outreach Program has much to offer in the area of technical assistance. Science advisors, materials, training and consulting are available.
6. The Self-Help program has been implemented at Washington Middle School and St. Charles.

Presentation by Col. Miller of the Kiwanis Club

1. Members are willing and able to devote time to mentor students with their science fair projects.
2. Members have a variety of technical backgrounds and would consider being judges

Workshops for parents were discussed as well as for students and their mentors. No specific dates were set.
Selection of Committees: The following committees were formed and some of the associated tasks discussed.

COMMITTEE	VOLUNTEER	TELEPHONE
Logistics	Kathy and Mike Aragon	877-9174 (H) Kathy
	Priscilla Diolazo	831-6380 (H)
		262-2260 (W)
Judging	Sandra and Pat Chavez	344-8791 (H)
		844-0813 (W) Sandra
	Mary Allen	880-1520 (H)
Mentoring	Barbara Menicucci	842-6330 (H)

David Menicucci	842-6330 (H)
	844-3077 (W)
Col. Miller	242-8146

Minutes of the St. Charles Science Fair Volunteer Committee
Date/time: December 10, 1991 5:30 p.m.

Attendees: Mike Aragon, Kathy Aragon, David Menicucci, Barbara Menicucci, Geri Romero, Zach Romero, Michael Garcia

1. There was a brief discussion about the agenda and the procedures for keeping minutes of each meeting. It was agreed that minutes should be sent to each member and to Ms. Hatok.

2. A report was given summarizing information about the previous workshop.

57 families attended with a total of 58 adults signing in
52 surveys returned gave positive responses stating that they found the material to be useful and understandable
5 respondants stated the limited number of handouts to be a negative aspect of the workshop
Generally the feedback was that the workshop was useful, especially to the 6th grade students and their parents
New items to consider for next year: Would information concerning the Invention Convention be useful? The question came up whether the school should keep the Invention Convention focus on just inventions or could scientific experiments be allowed at the lower grades. This might need to be discussed with the faculty, however no decision was made about it at this time.

Michael Garcia volunteered to condense the handout materials for next year. Additional copies are available from Martha in the office and three bound copies are in the school library.

Additional Items:

Selecting projects station needs at least 2 people
Need to review timeline for getting this process going earlier in the school year.
Need a Protocol subcommittee to work with Ms. Hatok so students can do living subjects research.
Could workshop follow a short Home & School meeting or is it better after school?
Were facilities adequate?

3. The committee felt it was important to become a standing committee within the Home & School organization. Plans to bring this about include a report of the workshop to be given at the next meeting; checking with Mr. Price and H & S president to get resolution introduced for vote to create standing committee; committee to begin operation at transition time in April '92.

4. Mike Garcia will handle getting judges for the school fair. He plans to review their credentials and work with Ms. Hatok to determine the criteria for judging.

5. Kathy Aragon will call Bill Miera to have him begin getting mentors for the mentoring workshop in January. We will discuss at the next meeting the number of mentors needed and how to appropriately match them with students. We will also determine the best time to hold the workshop.

6. Mike Aragon will continue to coordinate the logistics for the school fair including getting prices for renting tables and purchasing prizes for students.

7. Next meeting will be held in January '92 some time during the first full week of school. Kathy Aragon will set this up.

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To: Mr + Mrs Mike Aragon

via: Michelle - 1B

Minutes
St. Charles Science Fair Volunteer Action Committee Meeting
January 6, 1992

Attendees: Bill Miera, Dave & Barbara Menicucci, Zach & Gerry Romero, Michael Garcia, Mike & Kathy Aragon

The committee discussed the possibility of providing mentoring support to students as they finalize their projects. A workshop after school was considered, initially. However, since the committee did not have any idea how many students might need assistance, the members decided that a "Mentoring Hotline" might be a better way to direct students to specific mentors who had the appropriate expertise to help them. The committee identified the following plan and people to assist:

Mentors would be available from 7:00pm to 9:00pm Monday through Wednesday during the week of 1/13/92.
Students would be given information in their science classes about how to use the Mentoring Hotline and what type of help could be provided, keeping in mind that each student is expected to do the bulk of the work on the project and that mentors are supposed to guide, provide suggestions and help students get "unstuck" from problems in the work.
Students would call one person who would then provide them with the phone number of the appropriate person who could answer their questions and provide assistance.

Mike Aragon would be the person to call initially.
Mentors:
Bill Miera - Physical Science & Engineering
Mike Garcia - Life Science
Dave & Barbara Menicucci - Engineering, Life Science, & Physical Science
Col. Miller and Kiwanis volunteers - Engineering

Action Items

Bill Miera will call several other people to serve as mentors as needed. These people could also be considered as potential judges for the school science fair.

Mike Aragon will contact the science teacher to find out how much money will be required to cover expenses on the day of the fair (based on her experience from last year).

Barbara will contact an additional person who has volunteered to help on the committee. She will also write notices for the school and church bulletins, and contact the Home & School Assoc. president soliciting volunteers.

Mike Garcia will begin work on a description of the judging criteria to be given to judges at the school fair.

Next meeting: January 16, 1992 5:30pm.

Minutes
St. Charles Science Fair Volunteer Action Committee Meeting
January 28, 1992

Attendees: Mike & Kathy Aragon, Mike Garcia, Bill Miera, Dave & Barbara Menicucci, Col. Miller.

Agenda: Judging
Certificates
New business
Mentoring
Home & School status
Logistics for fair day

Few students made use of the Mentoring Hotline. Perhaps the science teacher had done a good job preparing them, or maybe they do not know how to avail themselves of help from adults. More thought on how to work with the students next year is needed.

18 judges confirmed - we would like to have 8-9 more

Dave will bring a copy of the judges' video to be played prior to beginning to judge at the school fair.

Mike Garcia will contact Lynn Hightower who coordinated the judging matrix for Washington Middle School. He will make judging assignments and create a tally sheet for judging.

Mike Aragon will ask Zach & Gerry Romero if they can help the committee with preparation of materials. He also will contact the plant manager to arrange setting up and removing tables on the day of the fair. He has purchased prizes/certificates.

Barbara will buy doughnuts and make coffee for judges.

Judges will assemble in the teachers' lounge 45 min. before the fair begins for an orientation presented by Mike Garcia.

Kathy Aragon will ask to make a report at the next H & S meeting.

Next meeting: Feb. 11, 1992 at 5:30 pm.

Minutes
St. Charles Science Fair Volunteer Action Committee Meeting
February 13, 1992

Attendees: Ms. Hatok (science teacher), Dave & Barb Menicucci, Col. Miller, Mike & Kathy Aragon, Mike Garcia.

Agenda: Feedback on Science Fair
List of recommendations & suggestions from members
Mentoring for regional fair
Home & School status
Plans for the future
(Turn noisy refrigerator back on)

Recommendation for a judging handbook to be created to include:
- overview of safety issues (electrical, chemical, mechanical biological)
- letter sent to judges prior to fair explaining the judging criteria and the awards they will be giving on that day
- Ms. Hatok recommended a judging chairperson for each class
- letter to each volunteer judge confirming their attendance
- attempt to better match judges' expertise with projects
- try to get enough judges to allow each project to be judged twice. If not possible, then make sure the top 15 projects get judged twice as they will probably be the regional representatives

Mentoring:
Received a list of the students going to regional fair
Ms. Hatok will identify the category for each project
The committee will assign a few students to each mentor and that mentor will contact them to see if the students need any help
We may want to consider a mentoring workshop similar to the one done at Taylor Middle School

Regional Entry Packet:
Ms. Hatok will contact the committee if she needs help completing any forms or determining the appropriate categories for the various projects.

Home & School:
There was a high level of frustration about the resistance of the H & S leadership to allow the inclusion of this committee as a standing committee. To date, we have not even been allowed to give a report to the general membership about our activities. Everyone present voiced varying degrees of concern, distress, outrage, and disgust, at this resistance. It is causing a serious moral problem among committee members which we recognize as interfering with our ability to support the teacher and students.

Next meeting March 3, 1992

St. Charles Science Fair Action Committee Meeting
Tuesday, March 3, 1992

Attendees: Kathy Aragon, Mike Aragon, Mike Garcia, Mrs. Hatok, Dave Menicucci, Barbara Menicucci.

Agenda:

Mentoring workshop
Task List for Committee members

Mrs. Hatok stated that she does not need any help from the committee from now until the end of the school year.

There was a discussion about the cost of the Science Fair for the school year 1991-1992. Mike and Kathy Aragon will determine the total amount spent this year, and will report at the next meeting. The report will contain a list of each expenditure and the amount of the expenditure. This will be necessary to propose a budget to the Home and School Association.

Barbara contacted ten people to determine if they were interested in becoming mentors for the students that are going to the regional competition. At least two people were interested. Letters were sent to those who were not reached by phone.

Dave reported on the mentoring workshop that was held at Taylor Middle school. Taylor held a post-fair mentoring workshop for regional entrants. There were twelve mentors at the workshops. Students set up their projects and were assigned a specific mentor to work with. Taylor made this workshop mandatory for the regional entrants. The workshop consisted of the students talking to their assigned mentors about the projects. Students took a signed list of suggestions home with them - in fact the students were required to show the list before they were allowed to leave. All the mentors and students showed up for the workshop.

Dave also reported on the the mentoring workshop that Washington Middle school hosted. The top 36 projects were involved. Mentors were called on to keep a log, and two mentors were assigned to each student. All the students and mentors met on a Saturday morning. A parent donated backboards and several parents cut out letters from construction paper so that the students could use the letters on their backboards. The workshop consisted of the parents and students putting together the student's display using the donated backboards and the paper letters. A computer was borrowed from the school, and several volunteers were using a graphical package to enter and print reports and graphs for those students who desired them.

Mrs. Hatok shared her "Science Fair" philosophy with the committee. She believes that partiticipating in the Science Fair should teach the students how to apply the scientific method. She wants her students to go to regional, but her emphasis is that everyone learns something and does his best, rather than emphasizing the awards, etc.

A discussion about parental attitudes regarding the Science Fair ensued. Mrs. Hatok made the observation that quite a few parents are not interested or involved in their child's participation in the Science Fair. The members of the committe supported Mrs. Hatok's observation. The committee agreed that there was a problem of parental non-involvement in the Science Fair, and the Home and School Association, and that there is a lack of community spirit in both organizations. The committee tried to pinpoint the reasons for this non-involvement : St. Charles is a magnet school, therefore the families in the school do not live in the same geographical area, parents pay tuition and may feel that is sufficient involvement.

The committee feels that they can affect the community spirit, but there are obstacles t hat must be overcome, i.e. becoming a part of the Home and School Association. After much discussion and emotional expressions of frustration the committee agreed that at least four problems exist (the problems relate to the SCSFAC but are equally applicable to a bigger problem that extends beyond this committee):

1. There is a frustration about the lack of affiliation with the Home and School Association.

2. There is a lack of "espri de corps" in the committee.

3. There is no understanding of the fundamental problem that prevents "espri de corps".

4. There is sporatic parental involvement.

The committee agreed on the following recommendations:

1. Identify the appropriate people to participate in the committee.

2. Try to find the root problem of the lack of "espri de corps."

3. Develop parental involvement from the grass-roots. level.

4. Talk to the people who dropped out of the committee and determine why they dropped out.

At the conclusion of the meeting an action plan was formulated. Kathy Aragon will write a letter to Mr. Price that contains a list of concerns and recommendations focused on the sustainability of this committee. The letter will request a response from Mr. Price to the committee and state that the committee will proceed with the recommendations unless otherwise notified. Before the letter is sent, the committee members will be allowed to comment and make suggestions.

A date was not set for the next meeting.

Date: June 10, 1992

To: Phillip Lee
President, St. Charles Home and School Association

From: Kathy Aragon
St. Charles Science Fair Volunteer Action Committee

Dear Phillip,

The St. Charles Science Fair Volunteer Action Committee (SCSFVAC) would like to continue our work that we started last year. We hope to work through the summer and plan for next year's activities. As an ad-hoc committee, we feel it is important to let the Home and School Association know our agenda for this summer.

The committee's goals for this summer follow:

1. Define tasks.

   There are three sub-groups in this committee - judging, mentoring, and logistical support. We hope to complete a time-line chart showing a list of tasks for each sub-group. The time-line chart will also contain the estimated time to complete each task. This task list will make it easier to delegate responsibility, so the workload will not fall on a few member's shoulders.

2. Develop a budget.

   Last year the committee provided hand-outs for the workshop, trophies and ribbons for the winners, and additional tables for the project displays. The money came from the school's operating budget. As a Home and School ad-hoc committee, we will ask the association for the needed funds to support our activities. The attached sheet lists the expenditures for the 91/92 school year. We don't anticipate the same funding for this year, because we probably will not have to rent tables, since Brother Peter has since purchased new tables.

3. Solicit additional members.

We would like the names of any parents who indicated a desire to help with the Science Fair on the volunteer sign-up sheets that were returned to the school. We want to contact them early this summer and request their help. It is very important that we know what our resources will be, in order to have each task assigned to a volunteer before the school year begins.

4. Sponsor a kick-off meeting.

Once the new members are identified, we will sponsor a kick-off meeting to introduce the new volunteers to the committee, its charter, and scope of operations. We want this committee to work in an atmosphere of camaraderie and good will. The Science Fair itself only takes place one day out of the year, but the committee is literally involved during the whole school year. It is important that we foster a close working relationship within the committee, because we will be spending a lot of time working together.

5. Conduct additional meetings, as needed.

The current members of the committee unanimously agreed that we need to become involved earlier in the school year. This means we must meet throughout the summer to plan for the next school year.

On behalf of the current members of the SCSFVAC, I would like to thank you for the good words you spoke at the May Home & School meeting regarding our role as a standing committee. As a group, we are committed to supporting the Science Fair as part of the school's core curriculum, therefore we will continue the work started last year, whether we remain an ad-hoc committee, or become a standing committee.

If the SCSFVAC becomes a standing committee, we can be assured of continuity in the membership, regardless of who is involved from year to year. This continuity is important, because of our active involvement with the science teacher and her curriculum. As I've mentioned before, the work of this committee lasts for nearly the duration of the school year, and planning for a new school year can begin earlier, if we preserve our continuity.

The SCSFVAC was very fortunate to have Sandia National Laboratories consult and mentor our efforts last year. We also had the unique opportunity of involvement by a community organization - the Kiwanis Club. As a direct result of the commitment to our efforts, by these two organizations, our efforts as a committee were very successful. The success of the committee may be judged by responses to two surveys that were conducted: the first was compiled during the student/parent workshop in December, 1991, and the second was sent to all sixth, seventh, and eight grade parents in May, 1992. However, Sandia's participation has ended, and we must accomplish the same tasks next year, without the guidance and mentoring we enjoyed last year.

I feel very positive that we can continue our successful efforts, since we, as a committee, have learned valuable lessons, and have gained experience in staging an effort such as ours. Incorporating into the Home and School will also bolster our efforts, and certainly our spirits.

Sincerely,

Kathy Aragon

St. Charles Science Fair Expenditures
for School Year 1991/1992

1.	Table Rental	200.00
2.	Trophies	100.00
3.	Copies of handouts	100.00
4.	Misc. (Donuts, coffee for judges)	10.00
	TOTAL :	410.00

ST. CHARLES BORROMEO SCHOOL

Handout Materials for
Parent/Student Workshop

HANDOUTS FOR WORKSHOP STATION:

SELECTING A TOPIC AND GETTING ORGANIZED

SELECTING A TOPIC FOR THE SCIENCE AND ENGINEERING FAIR

Students complete science fair projects for a variety of reasons. For many, it is a requirement of the regular science curriculum for the school. Others choose to do a project because they are interested in science or engineering and want to investigate these areas. Finally, other students find the competition exciting. Regardless of the reasons, a science or engineering project is an excellent opportunity to get real "on the job training" in carrying out a long-term independent study and to share experiences with other students. As a result, the most important aspect of choosing a topic is to select one that the student finds interesting and fun. Listed below are some things to consider in making a choice.

Interests
- What kinds of things does the student enjoy doing?
- What area of science or engineering does the student find interesting?
- What kinds of books does the student like to read?
- Does the student have any special skills or talents?

Is this a project that the student can do?
- How hard will the topic be for the student to understand?
- Is the student familiar with the topic or is it new?
- Will the student need to gather a lot of outside information and how long will it take?
- Can books be checked out from the library or will they need to be used there?
- Will professional advice be needed and is it available?
- How much involvement will be required from parents?
- Will the student be able to work in this area for 10 - 12 weeks and still be interested?
- Can a special schedule be set up to complete all the things that will need to be done?
- Is it possible to complete the project in the time allowed or will it need to be broken into phases?
- Does student have enough free time to work on the project?
- What special tools or apparatus will be needed and are they available at a low cost?
- Is there anything about the experiment the student's family will object to?

Safety
- Will the student be able to follow all safety rules as outlined in the rule book referenced below?
- Are there any dangers from equipment or materials associated with the project?
- Will there be any danger to the student or the subjects of the experiment at any time during the investigation of this project?

Clearly, selecting an appropriate topic depends on several factors that must be discussed and agreed on before the project is begun. Participants in local science fairs are encouraged to follow the guidelines for participating in the International Science and Engineering Fair. These are available in a booklet entitled "Rules of the International Science and Engineering Fair and all ISEF Affiliated and Local Feeder Fairs". Copies may be obtained by writing to Science Service, 1719 N Street N.W., Washington, DC 20036 or calling 202/785-2255.

SELECTING THE CORRECT CATEGORY

Because each project competes against all of the other projects in the same category, it is important to place the project into the correct category. Errors usually arise because the student confuses the basic idea behind the project with some of the methods or equipment used to carry out the work. For example, many projects involve the use of the computer, but only a few qualify for placement in the Computer Science category. Today's science and engineering projects are becoming increasingly interdisciplinary, so it is important to identify the primary emphasis of the project. By determining this emphasis, the student can more easily select the correct category.

Descriptions of the science fair categories are given below. In addition, some examples of project areas and how they might fit into different categories are also given. If the student is not sure about the appropriate category, he or she should contact science fair officials for assistance before completing the registration forms.

DESCRIPTIONS OF SCIENCE FAIR CATEGORIES

BEHAVIORAL AND SOCIAL SCIENCES Psychology, sociology, anthropology, archaeology, ethnology, ethology, linguistics, animal behavior (learned or instinctive), learning, perception, urban problems, reading problems, public opinion surveys, educational testing.

BIOCHEMISTRY Molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones, etc. (This is often a senior division category only, and is occasionally eliminated at some fairs because of the small number of entries.)

BOTANY Agriculture, agronomy, horticulture, forestry, plant taxonomy, plant physiology, plant pathology, plant genetics, hydroponics, algae, etc.

CHEMISTRY Physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, fuels, pesticides, metallurgy, soil chemistry, etc.

COMPUTER SCIENCE New developments in software or hardware, information systems, computer systems organization, computer methodologies, and data (including structures, encryption, coding and information theory), etc.

EARTH AND SPACE SCIENCES Geology, geophysics, physical oceanography, meteorology, atmospheric physics, seismology, petroleum, geography, speology, mineralogy, topography, optical astronomy, radio astronomy, astrophysics, etc.

ENGINEERING Civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, heating and refrigerating, transportation, environmental engineering, etc. Power transmission and generation, electronics, communications, architecture, bioengineering, lasers, computers, instrumentation.

ENVIRONMENTAL SCIENCES Pollution sources and their control, waste disposal, impact studies, environmental alteration, (heat, light, irrigation, erosion, etc.), ecology.

MATHEMATICS Calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability, topology, logic, operations research, and other topics in pure and applied mathematics.

MEDICINE AND HEALTH Medicine, dentistry, pharmacology, veterinary medicine, pathology, opthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing, etc.

MICROBIOLOGY Bacteriology, virology, protozoology, fungi, bacterial genetics, yeast, etc.

PHYSICS Solid state, optics, acoustics, particle, nuclear, atomic, plasma, super-conductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics, etc.

ZOOLOGY Animal genetics, ornithology, ichthyology, herpetology, entomology, animal ecology, anatomy paleontology, cellular physiology, circadian rhythms, animal husbandry, cytology, histology, animal physiology, invertebrate neurophysiology, studies of invertebrates, etc.

SOME PROJECT AREAS AND HOW THEY MIGHT FIT INTO DIFFERENT CATEGORIES

Instruments - The design and construction of a telescope, bubble chamber, laser, or other instrument would be Engineering if the design and construction were the primary purpose of the project. If a telescope were constructed, data gathered using the telescope, and an analysis presented, the project would be placed in Earth and Space Sciences.

Marine Biology - Behavioral and Social Sciences (eg. schooling of fish), Botany (eg. marine algae), or Zoology (eg. sea urchins)

Fossils - Botany (eg. remnants of ferns), Chemistry (eg. chemical composition of fossil shells), Earth and Space Sciences (eg. geological ages), and Zoology (eg. prehistoric animals).

Rockets - Chemistry (eg. rocket fuels), Earth and Space Sciences (eg. use of a rocket as a vehicle for meteorological instruments), Engineering (eg. design of a rocket), or Physics (eg. computing rocket trajectories). A project on the effects of rocket acceleration on mice would go in Medicine and Health.

Genetics - Biochemistry (eg. studies of DNA), Botany (eg. hybrid corn), Microbiology (eg. genetic studies of bacteria), or Zoology (eg. fruit flies).

Vitamins - Biochemistry (eg. how the body deals with vitamin C), Chemistry (eg, analysis), and Medicine and Health (eg. effects of vitamin deficiencies).

Ecology - Environment - Pollution - For example, in a study of the eutrophication of Lake Erie: Behavioral and Social Sciences (the human beings who cause the problem), Chemistry (the process of eutrophication), Botany (growth of algae), Engineering (water purification micro-organisms), and Zoology (fish population). If the primary emphasis is environment, there is an Environmental Science category.

Pesticides - Biochemistry (eg. the mechanism of toxic effects), Botany (eg. plant intake and concentration), Chemistry (eg. composition of pesticides), Earth and Space Sciences (eg. mechanism of runoff), Medicine and Health (eg. effects on human beings and animals).

Crystallography - Chemistry (eg, crystal composition), Mathematics (eg. symmetry), Physics (eg. lattice structure), and Earth and Space Sciences (eg. crystal morphology and habit).

Speech and Hearing - Behavioral and Social Sciences (eg. reading problems), Engineering (eg. hearing aids), Medicine and Health (eg. speech defects), Physics (eg. sound), Zoology (eg. structure of the ear).

Radioactivity - Biochemistry, Botany, Medicine and Health, and Zoology could involve the use of tracers. Earth and Space Sciences or Physics could involve the measurement of radioactivity. Engineering could involve design and construction of detection instruments.

Space-related Projects - Note that many projects involving "space" do not go into Earth and Space Sciences: Botany (eg. effect of zero G on plants), Medicine and Health (eg. effects of G on human beings), Engineering (eg. development of closed environmental system for space capsule).

POSSIBLE TOPICS FOR SCIENCE FAIR PROJECTS

1. How can plants be grown without soil?
2. What are the best methods of removing stains from textiles and home furnishings?
3. What insecticides are the most effective?
4. What are the effects of trace elements on plant growth?
5. What are the comparative effects of different fertilizers on plant growth?
6. How effective is the action of toothpastes on bacteria?
7. What tropisms do plants exhibit?
8. What are the differences between human and other mammalian hair?
9. What are differences in pollen grains as shown by a microscopic study?
10. Can insects distinguish among colors? To what colors are they most attracted?
11. How are fingerprints made and how do they differ?
12. What biological fallacies can be found in modern day advertising?
13. What are the techniques of plant dwarfing?
14. What are some common types of molds and how do they differ?
15. Is it possible to hatch colored chicks?
16. What is the influence of varying environmental factors on the germination ratio of some common seeds?
17. How does size of tubes affect capillary action? Does capillary action vary for different liquids?
18. What are the effects of selected noises on the learning of white mice?
19. What is the relationship between height, weight, and cephalic index of a selected group of students during a stated growth period?
20. What are heat losses and specific heats of selected metals?
21. What are the specific gravities of selected materials as determined by a homemade hydrometer?
22. What is the effect of lens size on the light gathering qualities of a homemade telescope?
23. How do the reflection values of paints differ?
24. What effects do filters have on different types of photographic films?
25. What is the effect of different gases and gas and oil mixtures on the operation of an engine?
26. How effective are fire resistant and fire-proofed materials?
27. Can chromatic effects be induced in floral envelopes of the narcissus?
28. What are the effects of water soluble chlorophyll on white fats?
29. How do amino acids and sucrose sprays affect dwarf marigolds?
30. What are the effects of antiseptics and disinfectants on molds?
31. What are the blood types of tenth grade students in your high school in comparison with the U.S. average?
32. What are the effects of mating normal and vestigial winged fruit flies?
33. How can you determine experimentally whether there is any inheritance of an acquired trait?
34. How does the weight of a rolling object affect its speed? (or rolling distance, or collision with another object)
35. A study in human population genetics--tongue rolling.
36. Where did that trait first occur in my family? (A study of an interesting family trait in your own or some other family.)
37. How common is acne among teen-agers and what treatments are proving most effective? (A study conducted among classmates)
38. How do different combinations of sand, gravel, and cement affect concrete?
39. What is the probability of two people having the same birthdate?
40. Exploring fractals.
41. What physical disorders cause absences from schools? What percentage of absences are due to such causes?
42. Build an electrically indicating propeller-type anemometer and calibrate a galvanometer or voltmeter to MPH of wind velocity.
43. Construct a device to time and determine the rate of acceleration of a freely falling object.
44. Make and calibrate a gauge to measure the expansion or contraction of various materials due to temperature change.
45. How may Boyle's Law be explained through the operation of a homemade hydraulic press?

46. How may the Law of Conservation be proved by using an apparatus similar to that used by Joule?
47. How may the speed of sound and echoes be determined experimentally?
48. How may the relationship between length and width of resonance tubes and sound be determined by the use of homemade resonance tubes?
49. How may Archimedes' Principle be proved experimentally by the use of homemade equipment?
50. How may voltage drop be determined and predicted?
51. Do all metals sink in all liquids?
52. Does the rate of cooling a hot metal affect its hardness?
53. Are all parts of the human tongue's surface equally sensitive to taste?
54. What is the smallest concentration of a "taste" chemical which can be detected?
55 Is there a relationship between certain types of weather and the incidence of hay fever?
56. What is the effect of _____ on water plants and invertebrates? (Substitute any commercially available chemical such as detergents, oils, pesticides in the blank.)
57. Are there any biochemical differences between animals of the same species from two different isolated populations? (Enzymes and hemoglobins are the easiest to test for.)
58. What chemical are present in polluted water before and after chlorination?
59. Is there any relationship between eating a good breakfast and making good grades in classes before lunch?
60. What effect does _____ have on the web pattern produced by the _____ spider? (This type of project normally uses drugs or various types. Would radical changes in the value of normal environmental variables such as temperature or humidity also have an effect?)
61. Is there any relationship between the barometric pressure and the number of times teachers have to discipline school children during the day? How about cloud cover?
62. Is there any relationship between the phases of the moon and either the rate of seed germination or the percentage of seeds that germinate successfully?
63. Some plants grow well together and some plants do not (This is the idea of companion planting) If two plants don't grow well together, can a substance be extracted from one kind of plant that has an adverse effect on the growth of the other?
64. Can nitrogen fixing bacteria be found associated with the roots of common non-leguminous plants?
65. How much more light bounces off a dust-filled atmosphere than a clean one?
66. Is there a relationship between the mass/height ratio of persons and their heartbeat rate?
67. Is there any relationship between the diversity of life forms in different bodies of water and the level of pollutants in that water?
68. What are the actual constituents of "Folk Medicines"? (Many old folk medicines have been found to use plants that contain natural products resembling modern medicines used to treat the same diseases the folk medicine is used to treat.)
69. What is the effect of watching certain kinds of T.V. programs on pulse rate?
70. Is there any relationship between the scent of flowers and their color?
71. Do the colors of food packages affect which ones are bought?
72. Are "ecologically safe" washing powders as good as ordinary washing powders?
73. How does the velocity of sound vary in different substances?
74. Can eggs withstand a greater force from one direction than from another?
75. How do the viscosities of lubricating, multi-grade, transmission or other oils vary with temperature?
76. How do the lubricating properties of various oils compare?
77. Does music have any effect on plants? What kind of music? What kind of plant?
78. Is there a relationship between a person's diet and the tendency for their fingernails to break?
79. Is there a relationship between measurable qualities of teachers or types of courses that students say are their "favorites" and how much work they have to do for those teachers or courses?
80. What liquids do rats or mice prefer to drink if given free choice? (Alcohol, sugar water, regular water, coffee, tea, etc.)
81. How can _____ be made to work better? (This is an engineering question where the student picks a piece of apparatus or equipment, studies its function and tries several new designs to make it work better.)
82. What thrust is exerted by an average sprinter as he or she starts to run?
83. What is the percentage of body fat found on male and female swimmers compared to a similar group of males and females who do not regularly engage in an active sport?
84. Is there a relationship between lung capacity and height? or weight?

85. Does one taste prevent another one from being tasted? What are the relationships between the concentrations of the two if this is true?
86. Does electricity have any effect on plant growth? How about on repairing slightly damaged stems?
87. What is the effect of introducing moderate amounts of fertilizer to a wild plant community? (Do all the plants grow better? Do some grow better than others? Does the diversity of the community increase, decrease, or stay the same?)
88. What is the relationship between liquid input and urine output in humans? Other selected species?
89. What is the relationship between conditions (temperature, wind speed, pressure, cloud cover, etc.) one hour and the weather the next hour? Day? Week?
90. Can bacteria that secrete substances which promote the growth of a plant be isolated from the roots of that plant? That inhibit the growth of a competing species?
91. What are the effects of different kinds of shampoo on different types of hair?
92. What is the effect of varying the amount of light and/or temperature on the growth of different kinds of micro-organisms
93. Which colored constituents of leaves or flowers change colors when the pH is varied?
94. Can the scent be extracted from flowers? If so, and the scent from one kind of flower be separated into different components, each with a characteristic scent?
95. Which of several brands of a certain type of product is most effective?
96. Do different kinds of (tobacco) cigarettes produce different kinds of smoke?
97. What is the effect of cigarette smoke on crickets?
98. Do plants that are prayed over grow faster/better than plants that are not?
99. Does plant growth affect the pH of the soil in which it is grows?
100. What are the levels of various pollutants in different bodies of water in a certain area? If there are differences why?

SCIENCE FAIR EXPERIMENT TITLES

Earth and Space Science

Precession of the Earth
The Red Planet--Can We Live On It?
How Do the Planets Move through the Sky?
How Does Florite Fluoresce?
Setsmoscope -- What They Do
How Much Power Is the Sun Putting on My Lawn Per Square CM?
Crystals and Geodes
Simple Passive Solar Heating
What Effects Do Grain Size and Shape Have on Porosity and Permeability?
Does Slope Affect Stream Velocity?
The Wind Chill Factor
How a Homemade Spectroscope Works
Waves. Why They Break
Wave Formation in Sand

Engineering

Does the Shape of a Nosecone Affect the Altitude a Model Rocket Will Attain?
Which Truss Design Makes the Strongest Bridge?
Solar Heat When the Sun Is Not Out
How Does the Aerodynamical Design of a Car React to Wind Resistance?
Will Salt Hydrates Improve the Performance of Passive Solar Heating Systems?

Environmental Science

How Differences in Water Temperature Affect Microscopic Life in Pond Water
How Do Various Detergents Affect the Surface Tension of Water
Nitrogen Content Level in Fuel Exhaust
Why Do Some Soils Absorb Water Faster than Others?
What Materials Absorb the Most Oil in an Oil Spill?
Does Acid Rain Hurt Some Buildings and Statues?
The Effect of Acid Rain on Plant Growth and Germination
Testing Various Water Sources for Nitrates

Mathematics

What Are the Properties of Matrices?
Complex Numbers
Binomial Distribution Experiment
Area Measurement Using the Monte Carlo Method
Cycloid Curves
Fibonacci Numbers
Can a Mathematical Model Be Devised to Predict the Outcome of Sporting Events?

Zoology

Chemoreception In Musca Domestica
Color Genetics of Netherland Dwarfs
All About Butterflies

Medicine and Health

Chemical Effects on Oral Bacteria
Hot or Not: A Test of the Accuracy of Thermometers
The Effects of MSG on Mice
How Soluble Is Your Calcium Supplement?
Testing for Diabetes

GETTING ORGANIZED

One of the biggest pitfalls in a long-term assignment is the tendency to leave things until the last minute. This tendency to procrastinate is not limited to students--many people battle with this problem into their adult years. A schedule with short-term due dates will help to prevent the work from piling up at the end and can provide the student with a continuing sense of accomplishment as the work on the project progresses. An outline for a twelve-week schedule is given below. If the student has less than twelve weeks before the science fair project is to be completed, this schedule can be adjusted to fit the time available.

12-Week Timetable

Date of the science fair_____

Date to begin working on the project_____

Scheduled Completion Date	Actual Completion Date	
_____	_____	12 Weeks before the fair

- Choose a topic or problem to investigate
- Make a list or resources (libraries, places to write, people to interview)
- Select your reading material

_____	_____	11 Weeks before the fair

- Begin preliminary investigations
- Write for additional information from business firms, government agencies, etc.
- Start a notebook for keeping records. Write down what you have done so far
- Decide what materials you will use in the display. Make a list to be checked later.

_____	_____	10 Weeks before the fair

- Complete initial research
- Interview experts for more information
- Decide how to set up your investigation or experiment/begin a preliminary design for the construction of your engineering project
- Set up the experiment or collect materials for construction of the project
- Learn how to use any apparatus you need
- Write in notebook more of what you have done

_____	_____	9 Weeks before the fair

- Organize and read materials sent in response to your letters
- Decide whether you need additional material from outside sources
- Begin experiment or construction of engineering project
- Add information to project notebook as you work

Scheduled Completion Date	Actual Completion Date	
_____	_____	8 Weeks before the fair

- Continue the experiment or working on construction
- Continue recording notes and observations
- Take photographs of the project in progress
- Continue research for background information about the topic

_____	_____	7 Weeks before the fair

- Continue experiment or construction as needed
- Begin work on first draft of written report (statement of problem, hypothesis/engineering goal, preliminary information, bibliographic information)
- Continue recording notes and observations
- Continue taking photographs of project

_____	_____	6 Weeks before the fair

- Continue experiment or construction as needed
- Check with experts contacted earlier as needed
- Review books, articles, etc. for additional ideas
- Continue recording notes and observations
- Take photographs of final stages of project
- Review work done to date on report

_____	_____	5 Weeks before the fair

- Begin preparing signs, titles, labels for display
- Begin analysis of data collected
- Begin designing charts, graphs, or other visual aids for display and written report
- Have photographs developed and enlarged as needed
- Continue writing first draft of report including sections on experimental procedure or engineering approach and recording/analysis of data

_____	_____	4 Weeks before the fair

- Review analysis of data and results obtained
- Write second draft of your report to also include analysis of information, evaluation of possible solutions, and conclusions and presentation of results of your project
- Continue writing about progress in your notebook
- Continue designing display

_____	_____	3 Weeks before the fair

- Finish constructing display
- Write text for background of display and plan its layout
- Complete charts, graphs, and visual aids
- Work on draft of written report

Scheduled Completion Date	Actual Completion Date	
_____	_____	2 Weeks before the fair

- Write another draft of written report
- Do lettering of explanations and mount themon your display
- Check and double-check display for spelling, punctuation and grammar
- Mount graphs, charts, drawings, photographs
- Assemble apparatus or other display materials; check against your list
- Write and type final report

_____	_____	1 Week before the fair

- Proofread your written report
- Set up display at home and check for any flaws (leave standing for 2 days)
- Check and double-check everything, especially spelling, punctuation, and grammar on display
- Transport materials to science fair site
- Congratulate yourself!

HANDOUTS FOR WORKSHOP STATION:

THE SCIENTIFIC AND ENGINEERING METHODS

DESCRIPTION OF THE SCIENTIFIC METHOD

Scientists direct their efforts toward improving mankind's understanding of nature by searching for explanations, classifications, and models to predict natural phenomena. The end product of the scientist's efforts is knowledge, sometimes without regard to its immediate application in the world. When a student selects an investigative topic like this, the most important factor in the project is the proper use of the scientific method--an organized plan for conducting an experiment to gather information to help answer a question. It is important to select a problem that is not too general or broad in scope, a problem for which the student will have sufficient resources, materials and time to investigate it properly, and to design the experiment to eliminate biases as much as possible.

There are five basic steps in the scientific method. These include 1) identify a question to be answered, 2) hypothesis, 3) methodology, 4) data collection and analysis, and 5) draw conclusions. Each of these steps is outlined below:

1. **Identify a question to be answered** -- this involves formulating a very specific question about the topic which indicates what subjects will be studied and what variables will be observed. Preliminary research about the topic should be done including reading books and magazines, and talking with experts in the field. From the information gathered, the student can describe a curious physical behavior that he or she would like to explain through the use of an experiment.

2. **Formulate an hypothesis** -- Based on the preliminary research, the student usually has an "educated" guess about the answer to the question being investigated. This "hunch" is stated as the hypothesis to be tested. A well constructed hypothesis identifies the subjects of the experiment (plants, mice, etc.), states what is being measured (rate of growth, weight, behavior, etc.), states the conditions of the experiment (different colored light sources, junk food versus regular food, etc.), and the results expected (light colors produce faster growth rates than dark colors; junk food diets cause the mice to be more active, etc.)

3. **Methodology** -- The student can now develop a plan to test the accuracy of the hypothesis by examining the effects on the subjects of changes in certain experimental conditions or factors. The best design is a controlled experiment in which there are two groups of subjects--one which is observed while the experimental conditions change, and one which is observed while there are no changes made in the conditions. Since many things can go wrong with only one subject in each group, it is best to use several subjects (a reasonable number might be ten) in each group.

It is best to test only one change in condition at a time in order to observed the effects on the subject of just that one change. If several variables are changed at one time, the student will not be able to determine which variable affected the subject, and the results will be biased. In order to keep biases from creeping in, the student can do a variety of things. For projects involving seeds and plants, he or she might want to select seeds of uniform size or plants that are all the same height initially. Subjects can be assigned to the experimental and control groups randomly by flipping a coin. Using multiple subjects in each groups or repeating the experiment several times and recording all of the results helps to eliminate biases due to uncontrolled variables. It may be difficult to try to think of all the ways biases might influence the experiment, but careful planning and thinking ahead can help reduce the problem.

4. **Data collection and analysis** -- Students should collect data according to the plan for the experiment. That plan should indicate how precisely, how frequently, and in what way the effects of the variable should be measured. The condition that is being varied is called the independent variable and the effect on the subject that is being observed is called the dependent variable. All experimental observations should be recorded, and measurements should be made in metric units, when appropriate. Observations should also be quantified, if possible, thereby keeping them as objective as possible.

Once the data is collected, the student should analyze the results looking for interesting patterns in the data that might say something about the hypothesis. Data should be summarized and neatly displayed in tables, graphs and other visual aids that are clearly labeled to allow for easy reading. Some examples of tables and graphs are provided on another handout. The student should perform the appropriate statistical techniques to make the data more easily understood and to determine the significance of any differences that were observed in the experimental group. It is better to use simple

descriptive statistics that the student fully understands (such as finding the mean and standard deviation for the data) than to attempt to apply high powered statistical techniques that the student does not understand. Pictures taken during different stages of the experiment can also be part of the data collected. The available results help the student begin to formulate some conclusions.

Sometimes the data gathered may not confirm the original hypothesis. That's OK. The original hypothesis was simply an educated guess based on preliminary information. If the data do not support to hypothesis or even if they refute it, the student should begin to think about why this might be the case. Were there uncontrolled variables? Were the effects actually there, but they were too small to measure? This is all a normal part of the scientific process. If the experiment has been well designed to control extraneous variables, if the results are clearly substantiated by the data and if someone repeating the same experiment receives the same results, the experiment has been a success and the student has learned something he or she did not previously know about the topic.

5. **Draw conclusions** -- Based on the data and analysis, draw a conclusion about the accuracy of the hypothesis. One does not prove or disprove an hypothesis, but the student can make a statement that the evidence supports or does not support the hypothesis. It is also possible that the evidence will be inconclusive and the question will remain unanswered. The conclusion should state what the student accomplished, or what was really learned from the testing in the experiment. What relevance does it have to the world in which we live? Are there some additional questions that were raised as a result of doing the experiment?

DESCRIPTION OF THE ENGINEERING METHOD **

Work done by engineers centers around solving a problem. The end product is a physical device, a design for a device, or a process or procedure. The process used in creating these end products is called design, and the techniques employed are called the engineering method. Some of the engineer's concerns in applying this method include economic feasibility, safety, manufacturability, public reactions to the design, and effectiveness of the device or process in solving the problem.

There are five basic steps in the engineering method. These include 1) problem definition and engineering goal, 2) approach, 3) analysis, 4) evaluation, and 5) presentation of results. Each of these steps is outlined below:

1. **Problem definition and engineering goal** -- This involves identifying and describing the engineering problem clearly. Details should be provided to show that the problem is real and that a solution is needed. The limitations of the problem and some suggested, acceptable solutions are proposed. The final outcome of this step is a problem statement. The engineering goal follows directly from the problem definition and is stated clearly in this section.

2. **Approach** -- In this step the engineer documents the plan for reaching the engineering goal. This begins with a literature review about the problem and a brief discussion of what other people who have written about the same or similar problem have to say. It should include a discussion of previous work others have done to solve the problem and an explanation of why these efforts failed. If there are any new technological developments or scientific innovations which could be applied to the problem, they should be mentioned here. This section should then include a discussion of the additional information that is needed to solve the problem, how this information will be obtained. The level of accuracy of the experimental data is also described here.

After this discussion, the engineer outlines the steps that will be used to solve the problem. Each step is described in enough detail to allow the plan to be easily understood by the reader. In general, the first steps in the process can be seen more clearly than those that will come later, so the amount of detail for the early steps will be greater. The latter steps often will depend on the results of the first ones, so the plan should describe how decisions will be made about these latter steps when they come up. The plan usually concludes with a timetable that shows the expected level of effort on each of the steps, and if a budget is involved, it will indicate the expected cost for each of the steps. This will insure that the goal can be achieved in the required time-frame and within an acceptable budget.

3. **Analysis** -- The basic objective of this step is to begin executing the plan outlined in the approach. Analysis consists of three components: data and information gathering, design, and checking results.

Data and information gathering is the process of collecting all the necessary information needed to solve the engineering problem. In addition to the information gathered from literature in the previous step, the engineer will often include results of testing and measurements of components or systems in order to understand their operational limitations and constraints. Other information may include the advice of experts and copies of mathematical or physical models. At this stage the engineer begins testing and measuring the effectiveness of all of the different types of approaches that he or she could use to achieve the goal. This testing can be done with physical, mathematical, or computer models. Testing and measuring continue until enough data exists to begin drawing conclusions about the details of the engineering solution.

Design involves considering all of the data gathered to this point and using them to construct specific engineering solutions. These solutions may be in the form of a physical device, a design for a product, or a description of a process, all of which are often referred to as the design product. The engineer may be able to think of several design products, and none of them is rejected at this time. The selection of the final design will be done in the evaluation step.

The purpose of checking results is to insure that no fundamental mistakes were made in the process of gathering information or formulating the design product. The engineer makes sure that all of the information used in developing the possible solutions is accurate and that the logic used in the design is sound.

4. **Evaluation** -- In this step the engineer considers the merits of each of the proposed design products with respect to the engineering goal. The design that most effectively meets the goal at a reasonable cost is selected. The engineer must consider the one-time costs of construction, the recurring costs of maintenance, and the effectiveness of the design to solve the engineering problem. Often the least expensive design is rejected because it is also less effective in solving the engineering problem than a more expensive design. In some cases a prototype device is built to demonstrate the effectiveness of the design. As a final step in the process, the selected design should be compared with the original design goal to insure that it meets the main objectives.

5. **Presentation of results** -- The presentation should clearly document the entire engineering process and should contain all of the details about the final design. A final report is prepared, and often an oral presentation is made to interested parties. Any recommendations for further work are documented at this time. These recommendations usually center on refinements that could be applied to the final design.

** Adapted from "Outline of the Engineering Method" by David Menicucci, Sandia National Laboratories.

HANDOUTS FOR WORKSHOP STATION:

PRESENTING YOUR PROJECT AT THE SCIENCE FAIR

PRESENTING YOUR PROJECT AT THE SCIENCE FAIR

The science fair project display is the culmination of weeks of study and preparation. As in the scientific and engineering workplaces, a person's investigation or experiment is not really complete until he or she has been able to document the results and present it to other people in the field. That is why the display for the science fair is as important as the investigative work. It is here that students can demonstrate their creativity in sharing what they have learned.

Each project entered in the fair must consist of three elements: the display unit, the exhibit materials, and the written report. In most science fairs, the displays are evaluated as part of the competition when the student is not present. As a result, they must present a complete picture of the student's efforts to the judges. Each science fair will have space requirements for the displays, so each student must design his or her display to conform to those requirements. Most displays will be placed on tables, but floor displays may also be acceptable. Below is a discussion of the important factors to be considered when designing the backboard for the display and the materials to present in front of the backboard. Information about the written report is given in an additional handout.

BACKBOARDS

The display unit, or backboard, is a kind of advertisement for the project. It is what people will see first and establishes the "professionalism" of the student's efforts. It should be constructed of sturdy and durable materials that will allow it to stand freely for several days. As a result, backboards usually consist of three equal-sized panels hinged together. Students should check the space requirements of the science fair before designing the display. Local science fairs are encouraged to follow the guidelines listed in booklet entitled "RULES OF THE INTERNATIONAL SCIENCE AND ENGINEERING FAIR and All ISEF Affiliated and Local Feeder Fairs" available from Science Service, 1719 N Street N.W., Washington, DC 20036 Phone # 202/785-2255.

Suggested materials:

pegboard and corkboard - available from a lumber store; predrilled holes are handy, but will need a frame or support to prevent buckling.

foam board - available from an art supply store; is light weight and can be cut easily; may need a frame if the display is particularly tall.

plywood and particle board - available from a lumber store; useful for larger floor displays; is very durable, but also can be quite heavy for setup.

To set up the display and make it look attractive, the student might want to consider painting the backboard or covering it with construction paper or fabric. It is best not to choose colors that are too bright or that otherwise draw the viewer's attention away from the information presented. The student will want to present enough information to fully describe the project and the results without the panels appearing too cluttered. The following information for either science projects or engineering projects should be included on the backboard. Note that it is essentially the same information that is contained in the student's written report, only in a condensed form.

SCIENCE PROJECT

Title of the project - neatly lettered, easy to read and fairly short.

Purpose or problem - this statement lists the student's reasons for pursuing the project. What did the student hope to learn by investigating this area? In an engineering project, this is the focus of the project-- what problem the student is trying to solve.

Hypothesis - In an experimental project, this is an educated guess or prediction about what the student thinks may happen.

Procedure - What did the student do to carry out his or her plan of action? What methods or materials were used to test the hypothesis or solve the engineering problem?
Results - What facts were discovered that were not known before the project was completed? The results should be presented using visual aids such as graphs, charts, diagrams, photographs, etc.
Conclusion - This statement summarizes the student's investigation and should offer an answer to the student's original question or problem. Sometimes students may discover something they did not expect--that should be included also because that is how scientists and engineers learn from their work.

ENGINEERING PROJECT

Title of the project - neatly lettered, easy to read and fairly short.
Problem definition and engineering goal - Describe what the problem is and what solution is needed.
Approach - An outline of the plan to solve the problem
Analysis - A description of the process to begin execution of the plan, to collect information, to design possible solutions, and to check results.
Evaluation - Evaluate all possible solutions and choose the best one.
Present Results - This is a complete description of the final solution.

All lettering should be neat and easily read from about four feet in front of the display. Different sizes of letters used for the title, section headings, and text, and space between sections on the backboard help the reader to see how the material is organized. Good hand lettering is sometimes sufficient, but stencils or press-on letters (available at art supply or large variety stores) often give a neater appearance. The student should check and double-check all spelling and punctuation. Also, students often misuse the words "affect" and "effect", as well as other words, so all text should be checked carefully.

EXHIBIT MATERIALS

The materials, devices, and samples shown in front of the backboards should reflect the items used throughout the student's investigation. The display items should tell a story or illustrate the scope of the project sufficiently so that the student scientist does not need to be present to explain the entire project to an observer. The materials should be arranged in an attractive way that illustrates important concepts of the project but avoids clutter. Students should always follow the safety requirements of the science fair concerning electricity, hazardous materials, and the use of live animals. These rules are included in the rule book for the International Science and Engineering Fair listed above which also contains all the protocol forms required when doing research on vertebrate subjects, humans, recombinant DNA, and tissue or pathogenic agents/controlled substances. These rules describe what types of items are not acceptable for research or for the display. In addition, students should use good sense when displaying small items that could be swallowed by children viewing the project or when displaying valuable and expensive equipment.

HANDOUTS FOR WORKSHOP STATION:

THE WRITTEN REPORT OR SCIENTIFIC PAPER

THE WRITTEN REPORT OR SCIENTIFIC PAPER

A complete science fair display includes a written scientific paper which is a summary of everything the student did to investigate the selected topic. In addition, the student may decide to submit a copy of this paper to the Junior Academy of Sciences--Scientific Paper Competition. (Students who do not do science fair projects are also eligible to compete in this activity.) The steps below comprise a guide for preparing a scientific paper.

1. **Select a Topic for Research**
   The topic of the paper is the same as the topic of the student's science fair project, or, for students who do not do projects, the paper will cover a topic of interest to the student. In either case, the topic should be limited in scope to one that is not too broad, has reference material available for preliminary study, allows for the possibility of first-hand observations and/or experimentation, and can be accomplished within the time frame available. (In the case of a project, it sometimes means the student completes one phase of the project during the course of one year.)

2. **Information Gathering**
   Students should use a variety of sources of information which may include books, encyclopedias, almanacs, abstracts and journals from specialized fields, and personal interviews with experts in the field. Newspapers and popular magazines are generally not good sources of factual information because they do not always report scientific information accurately or in enough detail to present the complete picture of the research. Students may want to use note cards or separate sheets of paper for each source of information. Students should be careful in copying dates and figures, proper names, unfamiliar terms, chemical formulas, etc. Double-check! The top of the card or sheet should contain all of the information about the source that will be required in the bibliography entry at the end of the report. A description of proper entries is given later in this document.

   Information from actual experimentation or construction done by the student is extremely valuable. The student should be careful to follow good scientific/engineering methods and keep careful records of all procedures used in a large notebook. He or she should keep careful records of all results in the same notebook, and should write additional notes of any unusual conditions or results in another section in the same notebook. (Since it is easy to misplace notebooks, a special place should be designated for all science fair materials that is safe and out of the reach of interested younger siblings and pets.)

3. **Organize the Information**
   Once the literature research and the experimentation or construction has been completed, the student can select from his or her notes those that will be used in the introduction or as supporting evidence in the body of the report. The note cards should be arranged in a probable sequence. Experimental notes should be reviewed to determine what facts should be illustrated by diagrams, charts, graphs, or photographs. Any direct quotes should be flagged for inclusion in the text and bibliography.

4. **Writing the research paper**

a. Abstract: When the report is complete, the student should prepare an "abstract" following the guidelines given on a separate page provided later in the document. A copy of the abstract is included as the first page in the written report.

b. Protocol forms: Completed protocol forms are required for all projects done using vertebrate animals, humans, recombinant DNA, tissue or pathogenic agents/controlled substances. Copies of the protocol forms are to be completed and filed according to the rules for the International Science and Engineering Fair. Copies should also be included in the front of the written report. Protocol forms are not required for all projects--just those involving the subjects and substances listed above.

c Title Page: The first page of the report should include the title of the project or will specifically identify the content of the scientific paper for competition. The title should clearly describe the nature of the study and be fairly short. The student may wish to include the date and some reference to the competition for which the report was prepared. Students should check the rules for including their name and grade as some competitions do not allow this information on the report.

d. Table of Contents: This page provides the reader with a list of the different parts of the report and the page number on which each section can be found.

e Statement of Purpose or Problem: This two-or three-sentence statement explains why the student selected this topic, what he or she expected to discover by investigating it, or what problem was to be solved. For a scientific paper competition this section may be replaced by an "Introduction" describing the significance of the topic and why it was chosen by the student.

f. Hypothesis or Problem Definition and Engineering Goal:
Students who select an experiment to perform should include the hypothesis which is an educated guess about what the student thinks will occur as a result of conducting the selected experiment. Students who select engineering projects should describe what the problem is, what solution is needed and outline the plan to solve the problem.

g. Research: This is the part of the report that contains all the background information the student collected about the chosen topic. Any books or articles read, authorities consulted, or outside materials collected should be summarized and presented in this section. It should be written in the student's own words and not copied from an encyclopedia or other reference.

h. Materials: This is a list of all the materials and supplies used in the project. Amounts of all materials should be indicated, especially if the student conducted an experiment.

i. Procedure: This section describes the steps the student undertook to complete the project. The steps are usually presented in a numbered format and show the stages of the project in such a way that others could reproduce the procedure. This goes back to one of the purposes of the report which is to share the student's information with other scientists in the field.

j. Observations and Results: In this section, the student tells what he or she has observed from the project. How do these results compare to results of others who have investigated the same or similar topic? The results should be discussed in detail and carefully analyzed to be sure that they are supported by the data gathered. Graphs, charts, or other visual data are effective ways to supplement the explanations written in the text. Visual aids should be labeled clearly and explained in the text of the report. Some examples of ways to display data are given as an additional handout. A common error is to include too much data in a single illustration. It is better to use a series of tables or other illustrations to present the results. The student should double-check that they are accurate, neat, and understandable. The reader should not have to spend a lot of time figuring out what the student is trying to say or interpreting graphs and charts. For an engineering project, the student should evaluate all possible solutions, describe how each attempts to solve the problem, and choose the best one.

k. Conclusion: This is a brief statement explaining why the project turned out the way it did and why the events occurred as they were observed. If an experiment was chosen, the conclusion should tell whether the data supports the hypothesis or does not support it. For an engineering project or for a general scientific paper for competition, this section will include a summary statement of the problem and the results obtained or a complete description of the final solution selected.

l Bibliography: This section should list all the printed materials consulted and the personal interviews conducted by the student in carrying out the project. Items should be listed in alphabetical order in a standard format. A page of examples is found later in this document. The term "bibliography" is properly used when all the literature pertinent to the subject has been reviewed. Since this is seldom done, the student may choose to title this section "Literature Cited" or "References" and list only the citations, quotations, and references given to interviews provided in the body of the report.

m. Acknowledgments: For students who have completed a science fair project, this is where he or she thanks all the individuals who assisted in the research or development of the project (including Mom and Dad). Note that experts who were interviewed will be listed in "References" rather than in the "Acknowledgments" section.

5. **Technical Details**

The student should use standard 8 1/2" x 11" paper and type or use the computer to print on one side of the paper only. Double space the text and use underlines, bold face or all capital letters to set aside section headings. Pages should be numbered at the bottom of the page, in the center. A list of charts and graphs may be prepared similar to the Table of Contents. The final copy should be neatly bound in an attractive folder or binder (available at any variety or stationery store).

Write and rewrite! The rough draft is just that, a first attempt at writing the research paper. There are no hard and fast rules as to how many drafts a paper should go through, but each draft should be an improvement on the one before it. A genuine, typical, professional paper may be revised fifty times before publication. Writing or typing the first draft with triple spacing allows the student to make revisions between the lines. The author may also want to have family members, teachers, or other experts review the report before the final copy is done. Using a computer word processing program can be very helpful at this point, but it is not essential. Before personal computers, everyone retyped scientific reports many times to get a final copy.

CORRECT STYLE FOR CERTAIN TYPES OF REFERENCES AND BIBLIOGRAPHIC ENTRIES

The key elements: Author, Date of publication, Title of article, book or paper, Where published (book chapter, journal, conference), and Publisher's name and location

1. Journal article, one author

   Jones, Thomas A. (1976). "The development of the chick." Animal Development Journal, 15, 27-34.

2. Journal article, two authors

   Becker, L. J., & Seligman, C. (1982). "Welcome to the energy crisis." Journal of Environmental Science, 37, 1-7

3. An entire book, one author, revised edition

   Cohen, J. (1977). Statistical power analysis for the behavioral sciences (rev. ed.). New York: Academic Press.

4. An entire book, more than one author

   Anderson, Garron P., Bennett, S. John, & DeVries, K. L. (1971). Analysis and testing of adhesive bonds. Long Beach, CA: Foster Publishing Co.

5. Edited book

   Letheridge, S., & Cannon C. R. (Eds.). (1980). Bilingual education: Teaching English as a second language. New York: Praeger.

6. Encyclopedias

   "Microcomputers." The World Book Encyclopedia, Vol. 11, (1990) Chicago, IL: World Book, Inc.

7. Conference paper

   Brener, J. (1979, October). "Energy, information, and the control of heart rate." Paper presented at the meeting of the Society for Psychophysiological Research, Cincinnati, OH.

WRITING AN ABSTRACT

Each student who completes a science fair project should write an abstract to be displayed with the project. Some fairs require a copy of the abstract be attached to the registration form for the fair. It should have the exact title of the exhibit as the heading, but most fairs require that the student's name not appear on it.

The abstract gives the essence of the project in a brief but complete form. It should not exceed 250 words and should be typed with double spacing. Judges and the public should have a fairly accurate idea of the project from reading the abstract. Details and discussions should be included in the longer written report. A general format for the abstract includes a paragraph on each of the following topics:

1. An introductory statement of the reason for investigating the topic of the project.

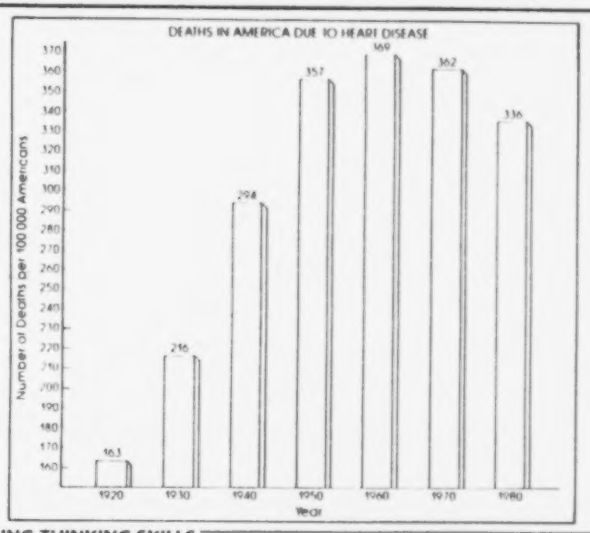
2. The purpose of the investigation--what the student attempted to prove or disprove. The project should try to set up and test a very definite question--such as "Does increasing the temperature made flowers blossom earlier?"

3. The abstract should also describe the key points and the general plan of how the investigation was done.

4. The results of the investigation or a brief analysis of how the problem was solved should be stated.

5. The conclusions from the investigation or a statement of the selected solution to the problem should be described briefly.

6. The student can summarize the project briefly by reflecting on the process or stating some applications or extensions of the topic in the final paragraph.



USING THINKING SKILLS

Heart disease is one of the biggest killers of Americans today. One method of treating people with severe heart disease is to perform a heart transplant. Another method is to give the person an artificial heart. Think about this as you answer the following questions.

1. One problem with depending on heart transplants is a shortage of heart donors. A long search is usually needed before the right heart is found for a person who needs one. How do you think doctors should decide who gets a specific heart? Explain your answer.
2. There are many problems with using an artificial heart. For one thing, people with artificial hearts have not lived for long periods of time. People who have artificial hearts have to be connected to many pieces of equipment. Should doctors continue to use artificial hearts? Explain your answer.

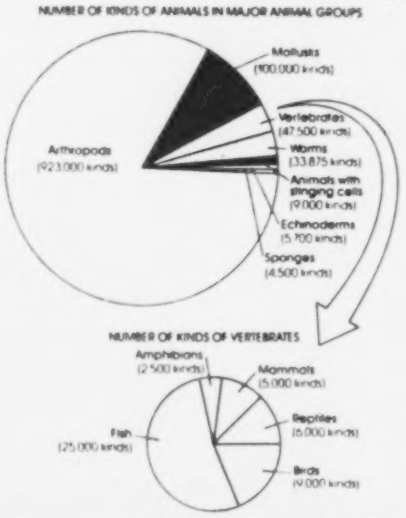
SKILL

Reading a Circle Graph

Look at these circle graphs. A circle graph is a good way to show how something is divided. The large circle graph shows how animals are divided, or classified, into major animal groups. It gives the number of different kinds of animals in each group. The smaller circle graph shows the major groups of vertebrates and gives the number of kinds in each.

Use the circle graphs to answer these questions.

1. Which is the largest major group of animals? Which is the smallest major group?
2. How many kinds of echinoderms are there? How many kinds of arthropods are there?
3. Which is the smallest group of vertebrates? The largest?
4. How many more kinds of worms are there than kinds of reptiles?



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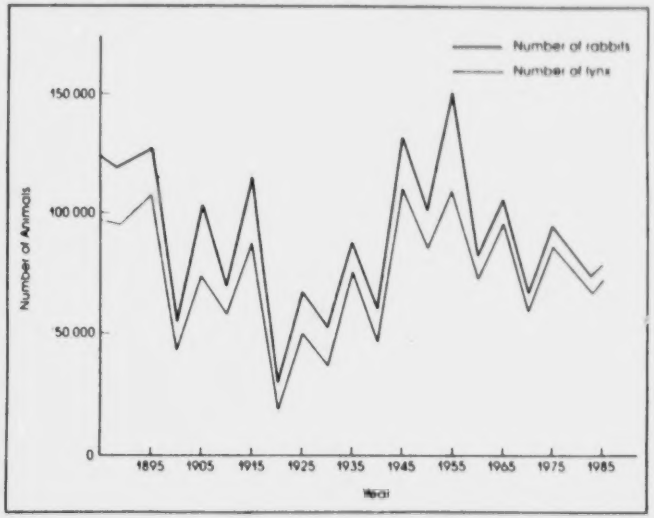
SKILL

Reading a Line Graph

Some line graphs contain only one line. Other line graphs, like the one shown here, contain two lines. This line graph compares the population of a group of lynx with the population of a group of rabbits. As you can see, the graph compares these populations over 90 years. Use the graph to answer the following questions.

1. During which year was the rabbit population the greatest?
2. During which year was the lynx population the greatest?
3. During which year was the rabbit population the lowest?
4. During which year was the lynx population the lowest?
5. What happened to the lynx population every time the rabbit population increased?
6. What happened to the lynx population every time the rabbit population decreased?



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SKILL

Reading a Table

Tables can be used to show and compare information. This table gives you the names of different animal groups and the names of different animals and their young. Use the table to answer the following questions.

1. What is a female hog called?
2. What is a group of lions called?
3. What is a young kangaroo called?
4. Which animals in the table travel in groups called herds?
5. Which of the male animals are called bulls?
6. What is a young seal called? What is a young turkey called?

NAMES FOR ANIMAL GROUPS, ANIMALS AND THEIR YOUNG

Animal	Group	Adult Male	Adult Female	Young
antelope	herd	buck	doe	kid
bear	sloth	boar	sow	cub
cat	clowder	tom	puss	kitten
cattle	herd or drove	bull	cow	calf
deer	herd	buck	doe	fawn
elephant	herd	bull	cow	calf
goose	flock or gaggle	gander	goose	gosling
hog	herd or drove	boar	sow	shoat or piglet
kangaroo	troop or mob	buck	doe	joey
lion	pride	lion	lioness	cub
rabbit	warren	buck	doe	kit or kitten
seal	herd or trip	bull	cow	pup or whelp
turkey	flock	tom	hen	poult
whale	herd	bull	cow	calf

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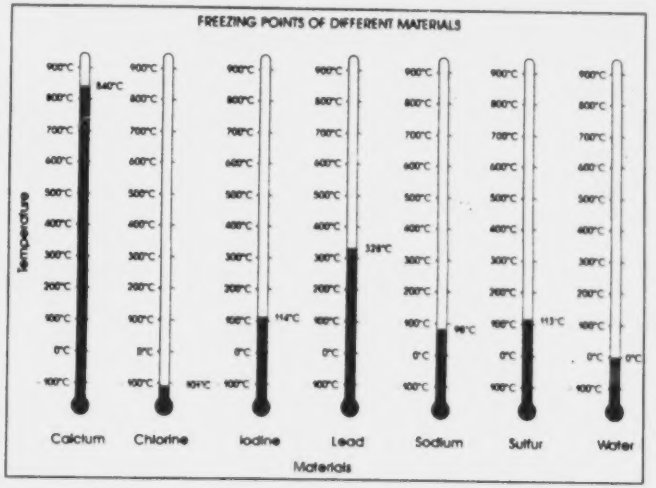
SKILL

Reading a Pictograph

A pictograph uses pictures or symbols to show information. This pictograph uses thermometers to show the freezing points of different types of matter. Use it to answer the following questions.

1. Which of the types of matter shown has the highest freezing point?
2. Which has the lowest freezing point?
3. Which has the higher freezing point—sodium or sulfur?
4. How much higher is the freezing point of lead than iodine?
5. Which of the materials shown would be a solid at room temperature (22°C)?



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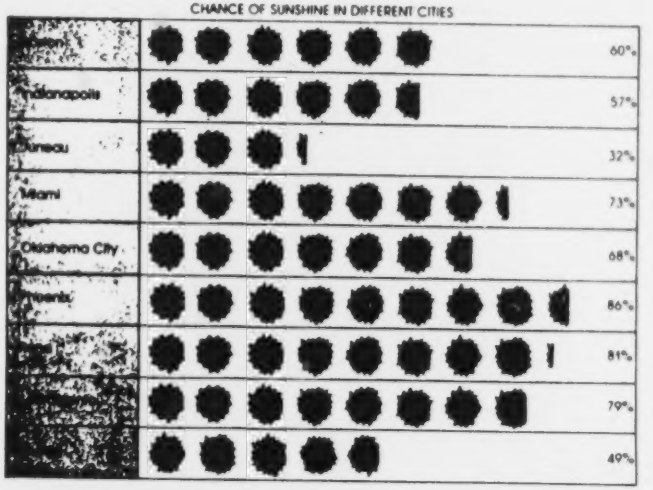
SKILL

Reading a Pictograph

Obviously, the amount of sunshine a place gets determines whether solar energy can be used there. This information can be shown with a pictograph such as the one you see here. It shows what chance there is of having a sunny day in different cities. Use the pictograph to answer the following questions.

1. In which city is there the greatest chance of having a sunny day?
2. In which city is there the least chance of having a sunny day?
3. In which of these cities is there a greater than 50 percent chance of having a sunny day? Less than a 50 percent chance?
4. Suppose you wanted to build a solar energy plant. Your research indicates that you must build the plant in a city in which there is at least a 70 percent chance of sunshine. In which of these cities could you build your plant—Boston, Seattle, Miami, or Sacramento?

CHANCE OF SUNSHINE IN DIFFERENT CITIES



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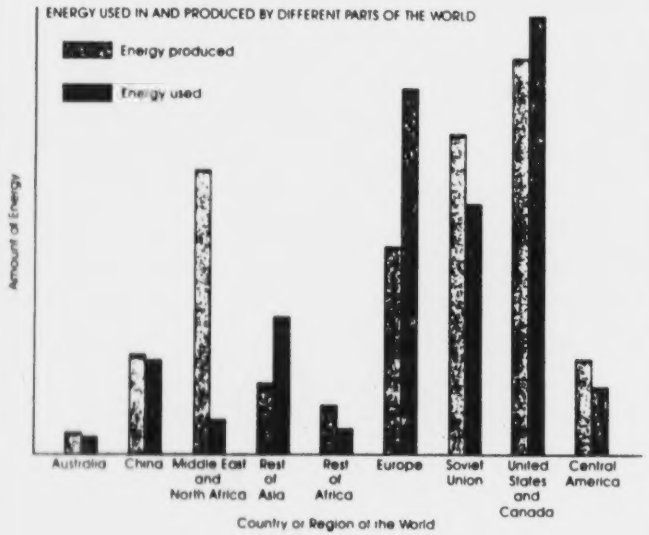
SKILL

Reading a Bar Graph

Some bar graphs can be used to compare two things at the same time. This bar graph compares the amount of energy different countries or regions produce with the amount they use. Use the graph to answer the following questions.

1. Which country or region uses the most energy? Which uses the least?
2. Which country or region produces the most energy? Which produces the least?
3. Which countries or regions produce more energy than they use?
4. Which countries or regions use more energy than they produce?
5. Which countries or regions use more energy than the United States and Canada do?



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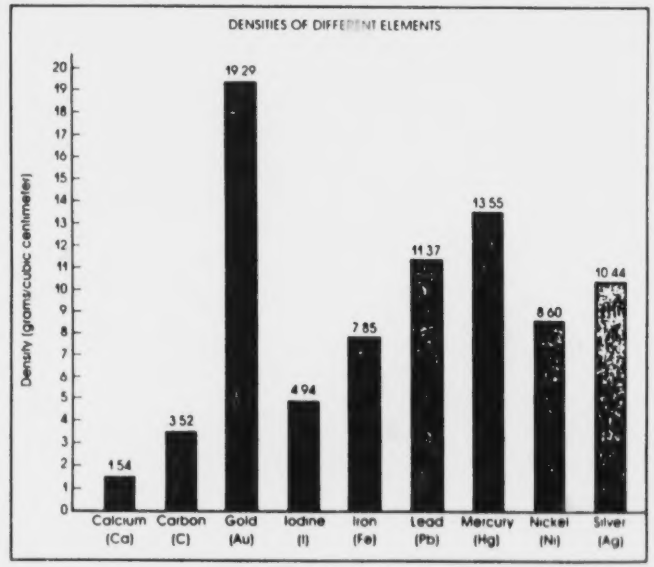
SKILL

Reading a Bar Graph

This bar graph shows the density of different elements. Use the graph to answer the following questions.

1. What is the most dense element shown?
2. What is the least dense element shown?
3. Which elements shown are more dense than silver?
4. How much more dense is mercury than carbon?
5. Topaz is a mineral with a density of about 3.6. Which of the elements in the table are more dense than topaz? Which are less dense?



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HANDOUTS FOR WORKSHOP STATION:

JUDGING AT THE SCIENCE FAIR

WHAT TO EXPECT DURING THE JUDGING ON THE DAY OF THE FAIR

Understandably, the students will be a bit nervous on the day of the fair. Students should remember all those bits of advice their parents and grandparents have given them about getting a good night's sleep, dressing neatly, standing up straight, speaking loudly and clearly, and making contact with the judges through the use of smiles and speaking directly to them. The judges are not specifically evaluating the student, but rather the soundness and presentation of the project done. However, it is much easier for judges to understand the student's work if they have pleasant and professional interactions with the student.

At most fairs, the judges have a chance to review each project for a few minutes before the students arrive. As a result it is important that the display have enough information on it to present a complete picture of the project by itself. It will also help the student when he or she arrives, because the student will be able to use the format of the display as a structure for his or her oral presentation to the judges. Students should be brief but address all of the components of the project.

The judges will probably have some questions. Students can prepare for these by having a relative or friend rehearse them with the student before the fair. Some common ones are:

- How or why did you get interested in this topic?
- Are there any aspects of the experiment or engineering project that you might have changed or corrected, if you had the time?
- Do you intend to continue work in this area? If so, how? If not, why not?
- What practical application or future use does your work have in the "real world"?
- Have you seen the article last month in the Such-and-Such Magazine by Dr. So-and-So dealing with the further implications of etcetera and so forth?

A student should not be afraid to admit that he or she does not know an answer or has not read the article or book in question. It is far better to be honest than to try to "snow" the judge. Science fair judges agree that the factors that come across most positively are knowledge and enthusiasm. Even if a student does not know an answer to a question, he or she can demonstrate genuine interest and enthusiasm in learning more about the question by listening to and interacting with the judge about the subject.

JUDGING CRITERIA

CREATIVE ABILITY (30%)
1. Is the project creative in
   - question asked
   - approach to solving the problem
   - analysis of the data
   - interpreting the data
   - use of equipment
   - construction or design of equipment
2. Collections are not creative
3. For engineering, avoid useless gadgets

SCIENTIFIC THOUGHT/ENGINEERING GOALS (30%) SCIENCE:
1. Is problem stated clearly?
2. Was the problem limited enough to solve but not so simple it is of limited value?
3. Was the procedure reasonable?
4. Are the variables defined?
5. Did the student recognize the need for controls and use them appropriately?
6. Was enough data taken to support the conclusion?
7. Is other appropriate scientific research cited?

ENGINEERING:
1. Is the objective clear and useful?
2. Is the solution workable, acceptable, and economic?
3. Is the solution an improvement over existing methods?
4. Has the solution been tested or possible methods of testing it been suggested?

THOROUGHNESS (15%)
1. Did the project meet its purpose within the scope of its original aims?
2. Has the problem been covered adequately?
3. Are the conclusions based on replication?
4. Was a notebook used to record all observations?
5. Were other approaches to investigating the topic considered?
6. Was enough time spend on the project?

SKILL (15%)
1. Does the student have the skills required to do all the work necessary to obtain the data which support the project?
2. What assistance was received?
3. How much of the work was the student's? What was the type and extent of help received from others?
4. Where did the equipment come from?

CLARITY (10%)
1. How clearly can the student discuss the project?
2. How clearly is the project presented and does it reflect a real understanding by the student?
3. Are important phases of the project presented in an orderly manner?
4. Are the data and results clearly presented?
5. Is the display clear and free of cute tricks/gadgets?

Appendix F:
Copies of the Survey Forms for Students, Parents, Teachers, and Community Volunteers

SURVEY OF RESULTS FOR SANDIA NATIONAL LABORATORIES SCIENCE FAIR SELF-HELP DEVELOPMENT PROGRAM 1991/1992 –ADMINISTRATOR/TEACHER/PARENT–

(Check ☑ all that apply)

1. What is your position at your school?

☐ **ADMINISTRATOR** ☐ **SCIENCE TEACHER** ☐ **PARENT OF SCIENCE FAIR STUDENT** ☐ **PARENT INVOLVED IN THE SCIENCE FAIR PROCESS**

2. Is your school's Science Fair part of the curriculum? ☐ **YES** ☐ **NO**

3. What do you think is the primary goal of your school's Science Fair?

4. Do you view the Science Fair more as a ☐ **Serious, competitive event** ☐ **Fun, learning event**

5. Which do you think is preferable for Science Fairs? ☐ **Emphasis on competition and winning awards** ☐ **Emphasis on enjoying the experience**

6. Which do you think is preferable for participation in Science Fairs?

☐ **A science fair with a small, select number of individually tutored students participating. (In this case most of the selected students win prizes at the regional and state science fairs, but not all students have the opportunity to participate.)**

☐ **A science fair with a large number of students tutored as a group. (In this case only a few students win prizes at the regional and state science fairs, but all students have the opportunity to participate.)**

7. Do you believe that your school's science fair process needed improvement before the Sandia self-help program was started? ☐ **YES** ☐ **NO** ☐ **NO COMMENT**

8. Did the self-help program assist you in developing a Science Fair Volunteer Support Committee that helped to make the necessary improvements? ☐ **YES** ☐ **NO** ☐ **NO COMMENT**

9. Did the self-help program assist you in more effectively using parent, teacher, and community resources in developing a Science Fair program? ☐ **YES** ☐ **NO** ☐ **NO COMMENT**

10. How would you rate the value of parent and community involvement in the Science Fair Volunteer Support Committee?
☐ **HIGH VALUE** ☐ **SOME VALUE** ☐ **LITTLE VALUE** ☐ **NO VALUE**

11. How much did the Science Fair Volunteer Support Committee assistance improve the science fair process at your school? ☐ **GREATLY IMPROVED** ☐ **SOMEWHAT IMPROVED** ☐ **SLIGHTLY IMPROVED** ☐ **NO CHANGE**

12. How effective was the self-help program in creating a permanent Science Fair Volunteer Support Committee for your science fair? ☐ VERY EFFECTIVE ☐ SOMEWHAT EFFECTIVE ☐ NOT EFFECTIVE

13. How would you rate the major elements of your Science Fair Volunteer Support Committee's activities that were outlined in the self-help program?

Logistics (organizing the Science Fair–gym, forms, prizes):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Judging (organizing the judging effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Mentoring (organizing the student tutoring effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

14. Do you think that Sandia's self-help program, as it was presented, is appropriate for schools? ☐ YES ☐ NO ☐ NO COMMENT

15. Do you think that the self-help program would be helpful to other grades (that is, elementary or high schools)? ☐ YES ☐ NO ☐ NO COMMENT

16. How would you rate the Sandia representative in helping to organize the Science Fair Volunteer Support Committee based on your school's needs?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

17. How would you rate the Sandia representative in offering technical support to the Science Fair Volunteer Support Committee?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

18. Do you believe that the Science Fair Volunteer Support Committee program would be helpful in other schools? ☐ YES ☐ NO ☐ NO COMMENT

19. What is the name of your school? _____

20. Do you have any comments or suggestions about the self-help program?

SURVEY OF RESULTS FOR SANDIA NATIONAL LABORATORIES SCIENCE FAIR SELF-HELP DEVELOPMENT PROGRAM 1991/1992 –SCIENCE FAIR STUDENT–

(Check ☑ all that apply)

1. Is the Science Fair a required assignment for science class? ☐ YES ☐ NO

2. What do you think is the primary goal of your school's Science Fair?

3. Do you think the Science Fair is more a ☐ Serious, competitive event ☐ Fun, learning event

4. Which do you think is better in Science Fairs? ☐ Emphasis on competition and winning awards ☐ Emphasis on enjoying the experience

5. Which type of science fair do you think is better?

   ☐ **A science fair with a small, select number of individually tutored students participating. (In this case most of the selected students win prizes at the regional and state science fairs, but not all students have the opportunity to participate.)**

   ☐ **A science fair with a large number of students tutored as a group. (In this case only a few students win prizes at the regional and state science fairs, but all students have the opportunity to participate.)**

6. Do you believe that your school's science fair process needed improvement before the Sandia's self-help program was started? ☐ YES ☐ NO ☐ NO COMMENT

7. Did the self-help program help your school develop a Science Fair Volunteer Support Committee that helped make the necessary improvements? ☐ YES ☐ NO ☐ NO COMMENT

8. Did the self-help program help your school more effectively use parent, teacher, and community resources in developing a Science Fair program? ☐ YES ☐ NO ☐ NO COMMENT

9. How would you rate the value of parent and community involvement in the Science Fair Volunteer Support Committee?

   ☐ HIGH VALUE ☐ SOME VALUE ☐ LITTLE VALUE ☐ NO VALUE

10. How much did the Science Fair Volunteer Support Committee assistance improve the science fair process at your school? ☐ GREATLY IMPROVED ☐ SOMEWHAT IMPROVED ☐ SLIGHTLY IMPROVED ☐ NO CHANGE

11. How effective was the self-help program in creating a permanent Science Fair Volunteer Support Committee for your science fair? ☐ VERY EFFECTIVE ☐ SOMEWHAT EFFECTIVE ☐ NOT EFFECTIVE

12. How would you rate the major elements of your Science Fair Volunteer Support Committee's activities?

Logistics (organizing the Science Fair–gym, forms, prizes):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Judging (organizing the judging effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Mentoring (organizing the student tutoring effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

13. Do you think that Sandia's self-help program, as it was presented, is appropriate for schools? ☐ YES ☐ NO ☐ NO COMMENT

14. Do you think that the self-help program can work in other grades (that is, elementary or high schools)? ☐ YES ☐ NO ☐ NO COMMENT

15. How would you rate the Sandia representative in helping to organize the Science Fair Volunteer Support Committee?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

16. How would you rate the Sandia representative in offering technical support to the Science Fair Volunteer Support Committee?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

17. Do you believe that the Science Fair Volunteer Support Committee program would help other schools? ☐ YES ☐ NO ☐ NO COMMENT

18. What is the name of your school? _____

19. Do you have any comments or suggestions about the self-help program?

SURVEY OF RESULTS FOR SANDIA NATIONAL LABORATORIES SCIENCE FAIR SELF-HELP DEVELOPMENT PROGRAM 1991/1992 –COMMUNITY VOLUNTEER–

(Check ☑ all that apply)

1. What was your involvement with the science fairs at the pilot schools? (check all that apply)

   ☐ SFVSC ORGANIZATION/ LOGISTICS ☐ STUDENT/ PARENT WORKSHOPS ☐ TECHNICAL CONSULTANT ☐ STUDENT MENTOR ☐ JUDGE ☐ OTHER

2. Do you believe that a science fair should be part of a school's curriculum? ☐ YES ☐ NO

3. What do you think should be the primary goal of a school's Science Fair?

4. Do you view the Science Fair more as a ☐ Serious, competitive event ☐ Fun, learning event

5. Which do you think is preferable for Science Fairs? ☐ Emphasis on competition and winning awards ☐ Emphasis on enjoying the experience

6. Which do you think is preferable for participation in Science Fairs?

   ☐ A science fair with a small, select number of individually tutored students participating. (In this case most of the selected students win prizes at the regional and state science fairs, but not all students have the opportunity to participate.)

   ☐ A science fair with a large number of students tutored as a group. (In this case only a few students win prizes at the regional and state science fairs, but all students have the opportunity to participate.)

7. Do you believe that the pilot schools' science fair process needed improvement before the Sandia self-help program was started? ☐ YES ☐ NO ☐ NO COMMENT

8. What did you expect from the self-help program, and were your expectations fulfilled?

9. Did you feel appreciated in the school(s) in which you were involved? ☐ YES ☐ NO ☐ NO COMMENT

10. Did you have all the information you needed to be effective in assisting the schools in which you were involved? ☐ YES ☐ NO ☐ NO COMMENT

11. Did the self-help program assist you to more effectively use your resources to develop a Science Fair program? ☐ YES ☐ NO ☐ NO COMMENT

12. How would you rate the value of parent and community involvement in the Science Fair Volunteer Support Committee?

    ☐ HIGH VALUE ☐ SOME VALUE ☐ LITTLE VALUE ☐ NO VALUE

13. How much did the Science Fair Volunteer Support Committee assistance improve the science fair process at the schools in which you were involved?

☐ GREATLY IMPROVED ☐ SOMEWHAT IMPROVED ☐ SLIGHTLY IMPROVED ☐ NO CHANGE

14. How effective was the self-help program in creating a permanent Science Fair Volunteer Support Committee at the schools in which you were involved? ☐ VERY EFFECTIVE ☐ SOMEWHAT EFFECTIVE ☐ NOT EFFECTIVE

15. At the schools in which you were involved, how would you rate the major elements of the Science Fair Volunteer Support Committee's activities that were outlined in the self-help program?

Logistics (organizing the Science Fair–gym, forms, prizes):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Judging (organizing the judging effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

Mentoring (organizing the student tutoring effort):

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR

16. Do you think that Sandia's self-help program, as it was presented, is appropriate for schools? ☐ YES ☐ NO ☐ NO COMMENT

17. Do you think that the self-help program would be helpful to other grades (that is, elementary or high schools)? ☐ YES ☐ NO ☐ NO COMMENT

18. How would you rate the Sandia representative in helping to organize the Science Fair Volunteer Support Committee based on the schools' needs?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

19. How would you rate the Sandia representative in offering technical support to the Science Fair Volunteer Support Committees?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR ☐ VERY POOR ☐ NO COMMENT

20. Which of the three pilot schools were you involved in?

☐ WASHINGTON ☐ TAYLOR ☐ ST. CHARLES

21. Do you have any comments or suggestions regarding the self-help program?

Appendix G:
Total Responses of Groups by Category

Table G-1. Philosophy Regarding Science Fair (Total Responses)

	Serious Competition	Fun Learn	Competition & Winning	Enjoy Experience	Individual Mentoring	Group Mentoring
Taylor Parents	6	78	8	76	16	62
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	16	46	12	31	13	36
Washington Students	30	95	42	84	55	75
St. Charles Parents	5	24	1	28	0	29
St. Charles Students	24	93	15	102	18	99
Community Volunteers	2	9	3	10	0	14
Science Teachers	1	10	2	9	0	13

Table G-2. Science Fair Values (Total Responses)

	Value of Parent & Community Involvement		Self-Help Program Appropriate for Other Schools?		Self-Help Program Appropriate for Other Grades?	
	High or Some	Little or None	yes	no	yes	no
Taylor Parents	63	14	54	3	62	4
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	37	8	32	2	36	0
Washington Students	82	44	54	15	70	15
St. Charles Parents	26	0	22	0	23	2
St. Charles Students	108	9	81	7	81	9
Community Volunteers	14	0	14	0	13	0
Science Teachers	9	4	7	1	8	0

Table G-3. Self-Help Program Effectiveness (Total Responses)

	Science Fair Process Needed Improvement?		Self-Help Program Help Use Parent Community?		Self-Help Program Help Create SFVSC?		How Much Did SFVSC Make the Necessary Improvements?	
	yes	no	yes	no	yes	no	Great/Some Improve-ment	Slight/No Improve-ment
Taylor Parents	32	16	42	17	34	16	57	10
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	14	4	18	6	12	2	38	10
Washingtong Students	30	8	57	24	48	17	75	42
St. Charles Parents	10	3	16	3	12	3	19	4
St. Charles Students	27	9	57	3	57	15	96	18
Community Volunteers	10	0	n/a*	n/a*	n/a*	n/a*	11	0
Science Teachers	8	1	7	2	6	4	10	2

*No comparable questions on community volunteer survey

Table G-4. Effectiveness of SFVSC Subcommittees (Total Responses)

	SFVSC Logistics			SFVSC Judging			SFVSC Mentoring		
	Excel/ V Good	Good/ Fair	Poor/ V Poor	Excel/ V Good	Good/ Fair	Poor V Poor	Excel/ V Good	Good/ Fair	Poor/ V Poor
Taylor Parents	26	44	4	28	37	6	28	44	2
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	19	20	6	28	16	2	25	16	6
Washington Students	43	74	6	42	71	5	52	51	15
St. Charles Parents	12	13	0	9	15	0	7	15	2
St. Charles Students	57	60	0	42	70	6	45	67	6
Community Volunteers	9	3	1	11	3	0	8	5	0
Science Teachers	5	4	2	6	5	0	4	4	1

Table G-5. Effectiveness of Sandia Technical Representative (Total Responses)

	Effectiveness in in Forming SFVSC			Effectiveness in Technical Consulting		
	Excel/ V Good	Good/ Fair	Poor/ V Poor	Excel/ V Good	Good/ Fair	Poor V Poor
Taylor Parents	38	33	2	36	32	2
Taylor Students	n/a	n/a	n/a	n/a	n/a	n/a
Washington Parents	26	16	0	29	13	0
Washington Students	38	66	5	51	53	3
St. Charles Parents	14	8	0	15	8	0
St. Charles Students	72	37	0	63	33	2
Community Volunteers	9	2	0	10	2	0
Science Teachers	6	3	0	6	2	1

Table G-6. Summary of Comments on the Surveys

Comments by Students:	
	Good program (6)*
	More publicity needed (2)
	Bad program (1)
	More literature needed (1)
Comments by Parents:	
	More publicity needed (6)
	More literature needed (3)
	Good program (5)
	Start program in elementary school (2)
Comments by Teachers:	
	More publicity needed (2)
	Good program (2)
Comments by Community Volunteers:	
	Good program (3)
	More publicity needed (1)
	Develop more community participation (1)

Distribution

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Albuquerque, NM 87104

Washington Middle School
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Attn: Ms. Rhonda Sandoval
1101 Park Ave. SW
Albuquerque, NM 87102-2967

St. Charles School
Attn: Mr. Doug Price
1801 Hazeldine SE
Albuquerque, NM 87106

St. Charles Science Fair Committee
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1833 Conita Real SW
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Albuquerque, NM 87131

University of New Mexico
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of Science
1333 H Street NW
Washington, DC 20005

National Association of Professional
Educators
412 First Street SE
Washington, DC 20003

National Science Teachers Association
1742 Connecticut Avenue NW
Washington, DC 20009-1171

Education Development Center
55 Chapel Street
Newton, MA 02160

National Education Association
1201 16th Street NW
Washington, DC 20036

National Science Foundation
1800 G Street NW, Room 527
Washington, DC 20550

School Science and Math Association
Bowling Green State University
126 Lite Science Blvd.
Bowling Green, OH 43403

American Educational Research Association
1230 17th St. NW
Washington, DC 20036

National Congress for Educational Excellence
11524 E. Ricks Circle
Dallas, TX 75230

International Association for Better Basic Education
19125 SW 107 Ln.
Dunnellon, FL 32630

Council for Basic Education
725 15th St. NW
Washington, DC 20005

Education Writers Association
1001 Connecticut Ave. NW
Suite 310
Washington, DC 20036

International Society for Intercultural Education, Training and Research
733 15th St. NW
Suite 900
Washington, DC 20005

Committee on Continuing Education for School Personnel
Kean College of New Jersey
Academic Services
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National Catholic Educational Association
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Elementary School Center
2 E. 103rd St.
New York, NY 10029

Federation for Unified Science Education
Capital University
231 Battelle Hall of Science
Columbus, OH 43209

Triangle Coalition for Science and Technology Education
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Boston, MA 02215

University of Missouri - Columbia
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219 Jesse Hall
Columbia, MI 65211

University of Oklahoma
Department of Education
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Norman, OK 73019

New York City Schools
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Brooklyn, NY 11201

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Hato Rey, PR 00919

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Los Angeles, CA 90012

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Dade County School District
1410 NE 2nd Ave.
Miami, FL 33132

Houston Independent School District
3830 Richmond
Houston, TX 77027

Philadelphia City School District
21st At Parkway
Philadelphia, PA 19103

Detroit City School District
5057 Woodward
Detroit, MI 48202

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Honolulu, HI 96804

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1320 SW 4th St.
Ft. Lauderdale, FL 33312

Dallas Independent School District
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Dallas, TX 75204

Fairfax County Public Schools
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Fairfax, VA 22030

Hillsborough County School District
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Tampa, FL 33601

San Diego City Unified School District
4100 Normal St.
San Diego, CA 92103

Baltimore City Public School System
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Baltimore, MD 21202

Memphis City School District
2597 Avery Ave., Room 214
Memphis, TN 38112

Duval County School District
1701 Prudential Dr.
Jacksonville, FL 32207

Prince Georges County Public Schools
8437 Landover Rd.
Landover, MD 20785

Clark County School District
2832 E. Flamingo
Las Vegas, NV 89121

Montgomery County Public Schools
850 Hungerford Dr.
Rockville, MD 20850

Jefferson County Public Schools
P.O. Box 34020
Louisville, KY 40232

Milwaukee School District
P.O. Drawer 10K
Milwaukee, WI 53201

Palm Beach County School District
3323 Belvedere Rd.
W. Palm Beach, FL 33402

Orange County School District
P.O. Box 271
Orlando, FL 32802

Pinellas County School District
P.O. Box 4688
Clearwater, FL 33518

D.C. Public Schools
415 12th St., NW
Washington, DC 20004

Orleans Parish School Board
4100 Touro Street
New Orleans, LA 70122

Baltimore County Public Schools
6901 N. Charles St.
Towson, MD 21204

Jefferson County R-1
P.O. Box 15128
Lakewood, CO 80215

Mecklenburg Charlotte School District
P.O. Box 30035
Charlotte, NC 28230

Granite School District
340 East 3545 South
Salt Lake City, UT 84115

Cleveland City School District
1380 E. 6th St.
Cleveland, OH 44114

Dekalb County School District
3770 N Decatur Rd.
Decatur, GA 30032

Mobile County School District
P.O. Box 1327
Mobile, AL 36633

Fort Worth Independent School District
3210 W. Lancaster
Fort Worth, TX 76107

Nashville-Davidson County School Dist.
2601 Bransford Ave.
Nashville, TN 37204

Long Beach Unified School District
701 Locust Ave.
Long Beach, CA 90813

Columbus City School District
270 E State St.
Columbus, OH 43215

Virginia Beach City Public Schools
P.O. Box 6038
Virginia Beach, VA 23456

Anne Arundel County Public Schools
2644 Riva Rd.
Annapolis, MD 21401

Atlanta City School District
210 Pryor St. SW
Atlanta, GA 30335

San Francisco Unified School District
135 Van Ness Ave.
San Francisco, CA 94102

Cobb County School District
P.O. Box 1088
Marietta, GA 30060

El Paso Independent School District
Box 20100
El Paso, TX 79998

Fresno Unified School District
Ed. Center, Tulare & M Sts.
Fresno, CA 93721

San Antonio Independent School District
141 Lavaca St.
San Antonio, TX 78210

Jordan School District
9361 So. 3rd E
Sandy, UT 84070

Austin Independent School District
6100 Guadalupe
Austin, TX 78752

Polk County School District
P.O. Box 391
Bartow, FL 33830

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